免費電子書

學習

Swift Language

Free unaffiliated eBook created from
Stack Overflow contributors.

#swift

1: Swift

Swift

SwiftApple 。 SwiftApplemacOSiOStvOSwatchOSObjective-CCocoa / CocoaAPI。 SwiftmacOS Linux。 AndroidWindows。

SwiftGitHub ;。

bugs.swift.org。

SwiftSwift 。

- Swift
- Swift
- Swift
- API
- Swift iBooks
- ...developer.apple.com 。

Swift	Xcode	
	-	2010-07-17
1.0	Xcode 6	201462
1.1	Xcode 6.1	20141016
1.2	Xcode 6.3	201529
2.0	Xcode 7	2015-06-08
2.1	Xcode 7.1	2015923
	-	2015123
2.2	Xcode 7.3	2016321
2.3	Xcode 8	2016913
3.0	Xcode 8	2016913
3.1	Xcode 8.3	2017327

Examples

Swift

`hello.swift`

```
print("Hello, world!")
```

- `swift`

  Linux`CTRL` + `ALT` + `T` *macOS* Launchpad。 `cd` **`directory_name`** `cd ..`

```
print("Hello, world!")
```

  。

- `swiftc`

```
print("Hello, world!")
```

`hello`。 `./` 。

```
print("Hello, world!")
```

- swift REPLRead-Eval-Print-Loop`swift`

```
print("Hello, world!")
```

  - `func greet(name: String, surname: String) { // function body }` - `namesurname` 。
  - `print("Greetings \(name) \(surname)")` - “Greetings”`name surname` 。 `\(` **`variable_name`** `)`。
  - `let myName = "Homer"let mySurname = "Simpson"` - `let myName mySurname`values `"Homer" "Simpson"` 。
  - `greet(name: myName, surname: mySurname)` - `myName mySurname`。

REPL

```
print("Hello, world!")
```

`CTRL` + `D`REPL。

Swift

。

Swift。 macOS/ Library / Developer / Toolchains。

```
export PATH=/Library/Developer/Toolchains/swift-latest.xctoolchain/usr/bin:"${PATH}"
```

Linuxclang

```
export PATH=/Library/Developer/Toolchains/swift-latest.xctoolchain/usr/bin:"${PATH}"
```

SwiftSwift

```
export PATH=/Library/Developer/Toolchains/swift-latest.xctoolchain/usr/bin:"${PATH}"
```

Swift

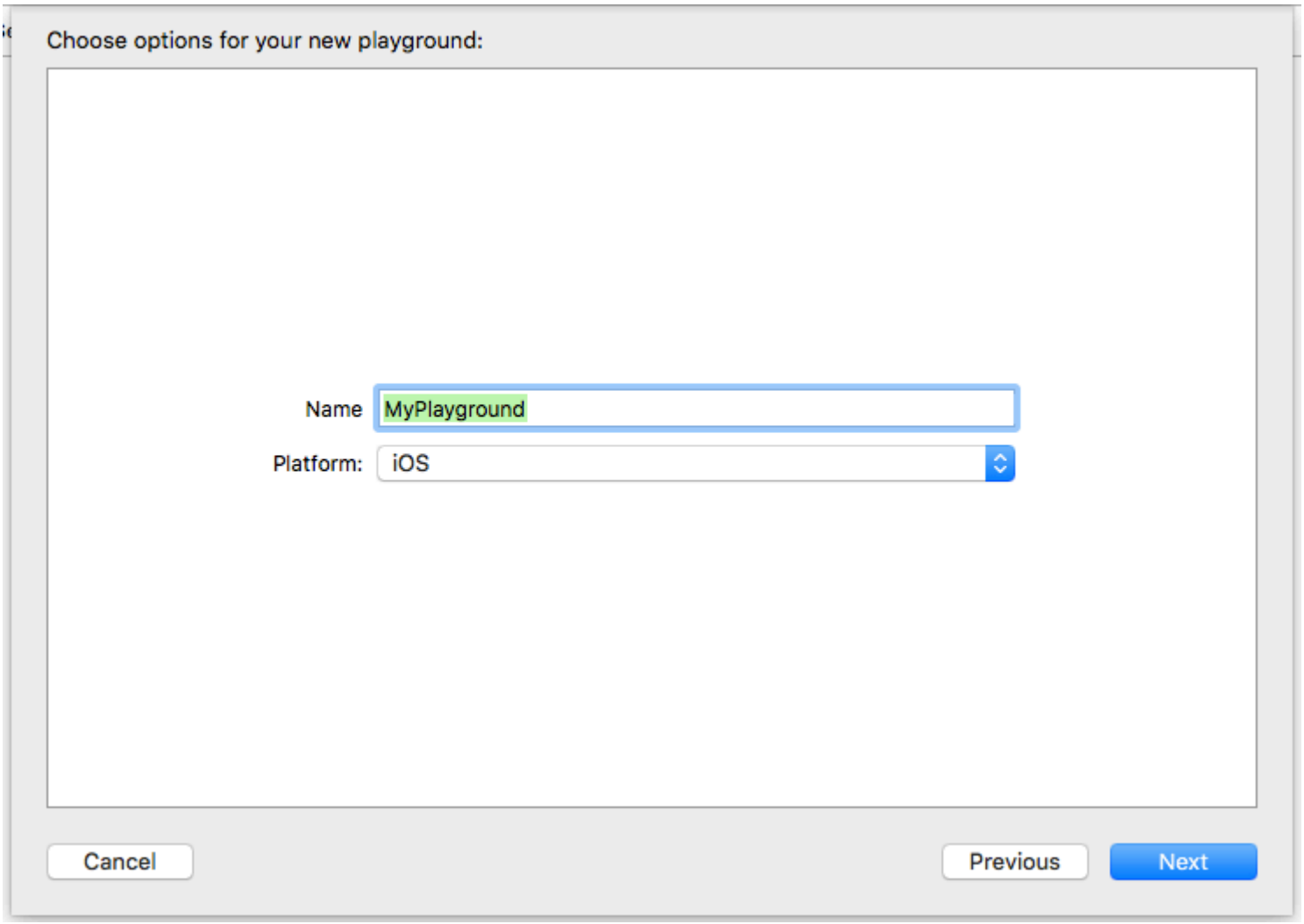
```
export PATH=/Library/Developer/Toolchains/swift-latest.xctoolchain/usr/bin:"${PATH}"
```

MacSwift

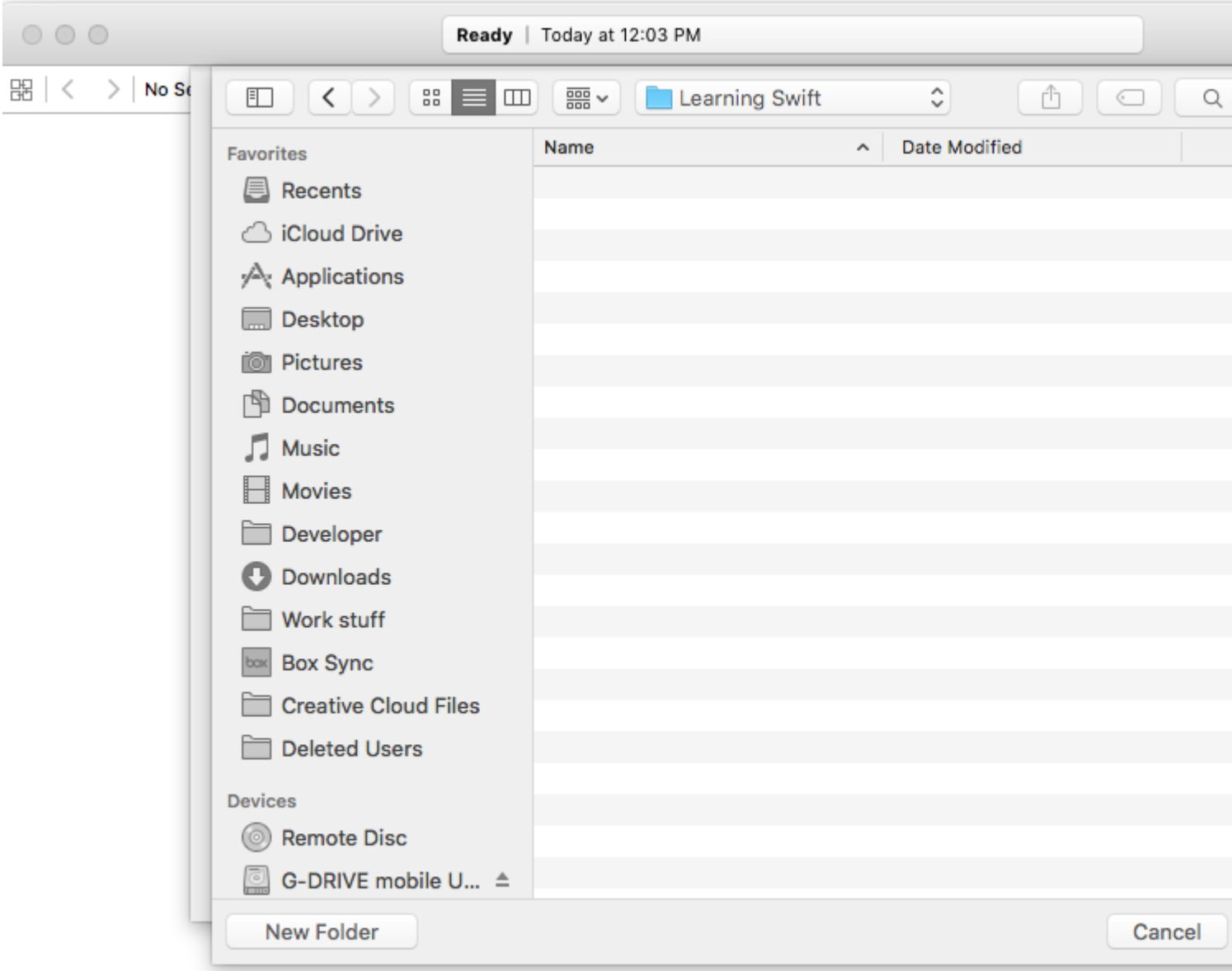
MacMac App StoreXcode。

Xcode**Playground**

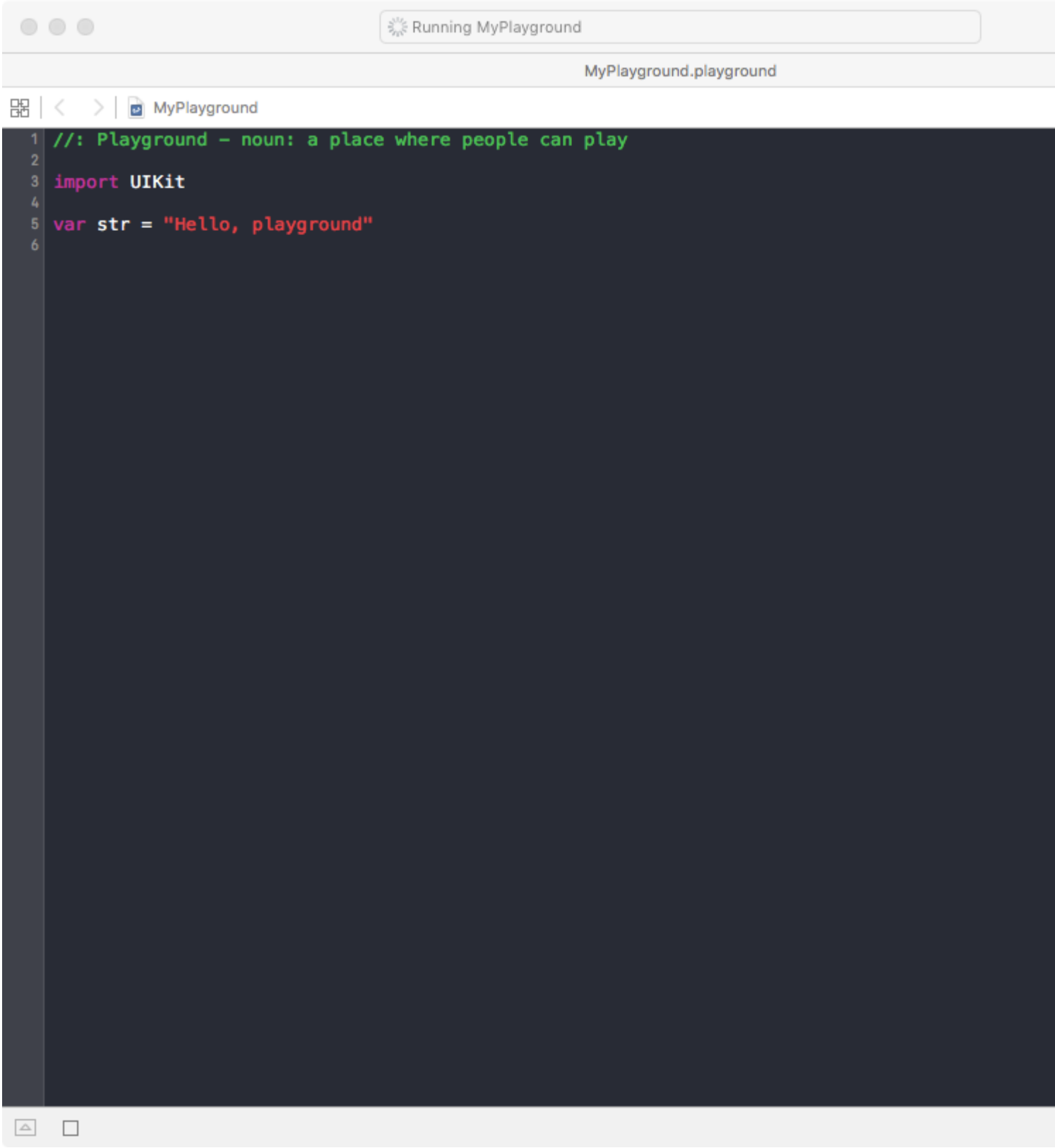
Playground`MyPlayground` “ ”



Playground**Create**


Ready | Today at 12:03 PM
Learning Swift
Favorites
Recents
iCloud Drive
Applications
Desktop
Pictures
Documents
Music
Movies
Developer
Downloads
Work stuff
Box Sync
Creative Cloud Files
Deleted Users
Devices
Remote Disc
G-DRIVE mobile U...
Name
Date Modified
New Folder
Cancel

Playground

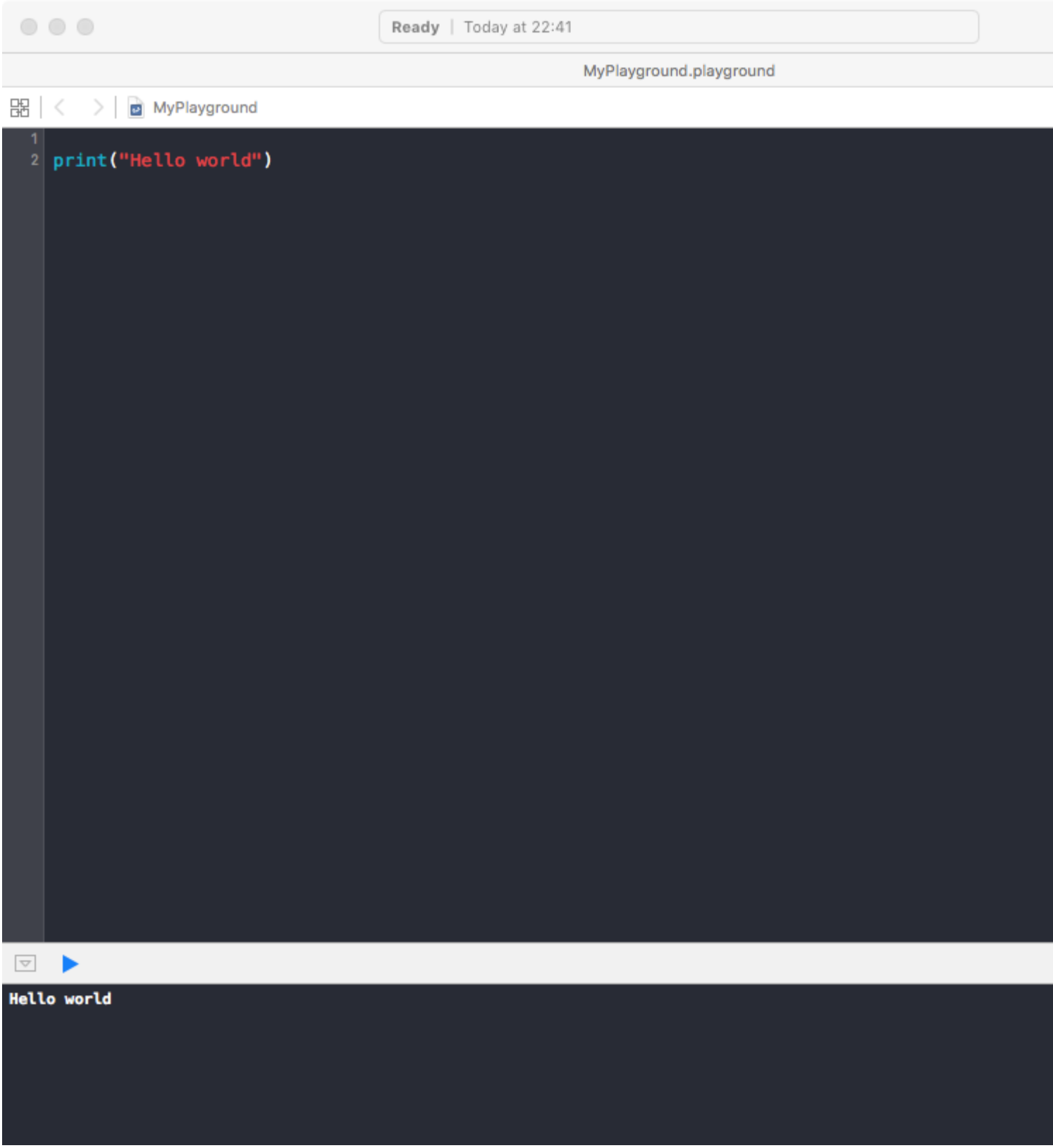


Playground + `cmd` + `Y` 。

Playground

```
print("Hello world")
```

“Hello world”“Hello world \ n”



Swift

iPadSwift Playgrounds

Swift PlaygroundsSwift。

1-App StoreiPadSwift Playgrounds 。


Mac
iPad
iTunes Preview
Swift Playgroun
By Apple
Open iTunes to buy and do
View in iTunes
Free

2.
3. “ ”+

2:

“。 。 “

Apple Inc.“SwiftCocoaObjective-CSwift 3.1。 ”iBooks。 https://itun.es/us/utTW7.l

。

BufferPointers。

- MemoryLayout 。
- Unmanaged 。
- UnsafeBufferPointer 。
- UnsafeBufferPointerIterator *UnsafeBufferPointerUnsafeMutableBufferPointer* 。
- UnsafeMutableBufferPointer 。
- UnsafeMutablePointer 。
- UnsafeMutableRawBufferPointer *nonowning*。
- UnsafeMutableRawBufferPointer.Iterator 。
- UnsafeMutableRawPointer 。
- UnsafePointer 。
- UnsafeRawBufferPointer 。
- UnsafeRawBufferPointer.Iterator 。
- UnsafeRawPointer 。

  Swiftdoc.org

Examples

UnsafeMutablePointer

```
struct UnsafeMutablePointer<Pointee>
```

。

UnsafeMutablePointer。 Pointee。 UnsafeMutablePointer。 。

。 UnsafeMutablePointer。

```
struct UnsafeMutablePointer<Pointee>
```

Swift 3.0

Swift;

```
public init?(validatingUTF8 cString: UnsafePointer<CChar>)
```

nullUTF-8。

UTF-8。 `nil` 。 `CChar` - UTF-8。

> **Source Apple Inc.Swift 3** For header accessIn PlaygroundCmd +Swift
>
> `import Swift`

```
public init?(validatingUTF8 cString: UnsafePointer<CChar>)
```

> SourceApple Inc.Swift Header File Example

https://riptutorial.com/zh-TW/swift/topic/9140/--

3: AES

Examples

IVSwift 3.0CBCAES

iv

`aesCBC128Encrypt`IV。
`aesCBC128Decrypt`IV。

。 Base64/。

128161922425632。 。

PKCS7。

Common Crypto

`#import <CommonCrypto/CommonCrypto.h>`

`Security.framework`。

。

```
enum AESError: Error {
    case KeyError((String, Int))
    case IVError((String, Int))
    case CryptorError((String, Int))
}

// The iv is prefixed to the encrypted data
func aesCBCEncrypt(data:Data, keyData:Data) throws -> Data {
    let keyLength = keyData.count
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let cryptLength = size_t(ivSize + data.count + kCCBlockSizeAES128)
    var cryptData = Data(count:cryptLength)

    let status = cryptData.withUnsafeMutableBytes {ivBytes in
        SecRandomCopyBytes(kSecRandomDefault, kCCBlockSizeAES128, ivBytes)
    }
    if (status != 0) {
        throw AESError.IVError(("IV generation failed", Int(status)))
    }

    var numBytesEncrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)
```

```
    let cryptStatus = cryptData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCEncrypt),
                        CCAlgorithm(kCCAlgorithmAES),
                        options,
                        keyBytes, keyLength,
                        cryptBytes,
                        dataBytes, data.count,
                        cryptBytes+kCCBlockSizeAES128, cryptLength,
                        &numBytesEncrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.count = numBytesEncrypted + ivSize
    }
    else {
        throw AESError.CryptorError(("Encryption failed", Int(cryptStatus)))
    }

    return cryptData;
}

// The iv is prefixed to the encrypted data
func aesCBCDecrypt(data:Data, keyData:Data) throws -> Data? {
    let keyLength = keyData.count
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let clearLength = size_t(data.count - ivSize)
    var clearData = Data(count:clearLength)

    var numBytesDecrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)

    let cryptStatus = clearData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCDecrypt),
                        CCAlgorithm(kCCAlgorithmAES128),
                        options,
                        keyBytes, keyLength,
                        dataBytes,
                        dataBytes+kCCBlockSizeAES128, clearLength,
                        cryptBytes, clearLength,
                        &numBytesDecrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        clearData.count = numBytesDecrypted
    }
    else {
        throw AESError.CryptorError(("Decryption failed", Int(cryptStatus)))
    }
```

```
    return clearData;
}
```

```
enum AESError: Error {
    case KeyError((String, Int))
    case IVError((String, Int))
    case CryptorError((String, Int))
}

// The iv is prefixed to the encrypted data
func aesCBCEncrypt(data:Data, keyData:Data) throws -> Data {
    let keyLength = keyData.count
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let cryptLength = size_t(ivSize + data.count + kCCBlockSizeAES128)
    var cryptData = Data(count:cryptLength)

    let status = cryptData.withUnsafeMutableBytes {ivBytes in
        SecRandomCopyBytes(kSecRandomDefault, kCCBlockSizeAES128, ivBytes)
    }
    if (status != 0) {
        throw AESError.IVError(("IV generation failed", Int(status)))
    }

    var numBytesEncrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)

    let cryptStatus = cryptData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCEncrypt),
                        CCAlgorithm(kCCAlgorithmAES),
                        options,
                        keyBytes, keyLength,
                        cryptBytes,
                        dataBytes, data.count,
                        cryptBytes+kCCBlockSizeAES128, cryptLength,
                        &numBytesEncrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.count = numBytesEncrypted + ivSize
    }
    else {
        throw AESError.CryptorError(("Encryption failed", Int(cryptStatus)))
    }

    return cryptData;
}

// The iv is prefixed to the encrypted data
func aesCBCDecrypt(data:Data, keyData:Data) throws -> Data? {
    let keyLength = keyData.count
```

```
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let clearLength = size_t(data.count - ivSize)
    var clearData = Data(count:clearLength)

    var numBytesDecrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)

    let cryptStatus = clearData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCDecrypt),
                        CCAlgorithm(kCCAlgorithmAES128),
                        options,
                        keyBytes, keyLength,
                        dataBytes,
                        dataBytes+kCCBlockSizeAES128, clearLength,
                        cryptBytes, clearLength,
                        &numBytesDecrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        clearData.count = numBytesDecrypted
    }
    else {
        throw AESError.CryptorError(("Decryption failed", Int(cryptStatus)))
    }

    return clearData;
}
```

```
enum AESError: Error {
    case KeyError((String, Int))
    case IVError((String, Int))
    case CryptorError((String, Int))
}

// The iv is prefixed to the encrypted data
func aesCBCEncrypt(data:Data, keyData:Data) throws -> Data {
    let keyLength = keyData.count
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let cryptLength = size_t(ivSize + data.count + kCCBlockSizeAES128)
    var cryptData = Data(count:cryptLength)

    let status = cryptData.withUnsafeMutableBytes {ivBytes in
        SecRandomCopyBytes(kSecRandomDefault, kCCBlockSizeAES128, ivBytes)
    }
    if (status != 0) {
        throw AESError.IVError(("IV generation failed", Int(status)))
```

```
    }

    var numBytesEncrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)

    let cryptStatus = cryptData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCEncrypt),
                        CCAlgorithm(kCCAlgorithmAES),
                        options,
                        keyBytes, keyLength,
                        cryptBytes,
                        dataBytes, data.count,
                        cryptBytes+kCCBlockSizeAES128, cryptLength,
                        &numBytesEncrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.count = numBytesEncrypted + ivSize
    }
    else {
        throw AESError.CryptorError(("Encryption failed", Int(cryptStatus)))
    }

    return cryptData;
}

// The iv is prefixed to the encrypted data
func aesCBCDecrypt(data:Data, keyData:Data) throws -> Data? {
    let keyLength = keyData.count
    let validKeyLengths = [kCCKeySizeAES128, kCCKeySizeAES192, kCCKeySizeAES256]
    if (validKeyLengths.contains(keyLength) == false) {
        throw AESError.KeyError(("Invalid key length", keyLength))
    }

    let ivSize = kCCBlockSizeAES128;
    let clearLength = size_t(data.count - ivSize)
    var clearData = Data(count:clearLength)

    var numBytesDecrypted :size_t = 0
    let options   = CCOptions(kCCOptionPKCS7Padding)

    let cryptStatus = clearData.withUnsafeMutableBytes {cryptBytes in
        data.withUnsafeBytes {dataBytes in
            keyData.withUnsafeBytes {keyBytes in
                CCCrypt(CCOperation(kCCDecrypt),
                        CCAlgorithm(kCCAlgorithmAES128),
                        options,
                        keyBytes, keyLength,
                        dataBytes,
                        dataBytes+kCCBlockSizeAES128, clearLength,
                        cryptBytes, clearLength,
                        &numBytesDecrypted)
            }
        }
    }

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
```

```
        clearData.count = numBytesDecrypted
    }
    else {
        throw AESError.CryptorError(("Decryption failed", Int(cryptStatus)))
    }

    return clearData;
}
```

CBCIV。 IVIV。 CBC。

。

PBKDF2。

RNCryptor 。

throw / catch。

CBCAESIVSwift 2.3

iv

aesCBC128EncryptIV。 aesCBC128DecryptIV。

。 Base64/。

12816。 Swift 3.0。

PKCS7。

Common Crypto#import <CommonCrypto / CommonCrypto.h>Security.framework。

Swift 3。

。

```
func aesCBC128Encrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)
    let cryptDataLength = size_t(data.count + kCCBlockSizeAES128)
    var cryptData = [UInt8](count:ivLength + cryptDataLength, repeatedValue:0)

    let status = SecRandomCopyBytes(kSecRandomDefault, Int(ivLength),
UnsafeMutablePointer<UInt8>(cryptData));
    if (status != 0) {
        print("IV Error, errno: \(status)")
        return nil
    }

    var numBytesEncrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCEncrypt),
```

```
                            CCAlgorithm(kCCAlgorithmAES128),
                            CCOptions(kCCOptionPKCS7Padding),
                            keyData, keyLength,
                            cryptData,
                            data, data.count,
                            &cryptData + ivLength, cryptDataLength,
                            &numBytesEncrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.removeRange(numBytesEncrypted+ivLength..<cryptData.count)
    }
    else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return cryptData;
}

func aesCBC128Decrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let clearLength = size_t(data.count)
    var clearData   = [UInt8](count:clearLength, repeatedValue:0)

    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)

    var numBytesDecrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCDecrypt),
                            CCAlgorithm(kCCAlgorithmAES128),
                            CCOptions(kCCOptionPKCS7Padding),
                            keyData, keyLength,
                            data,
                            UnsafePointer<UInt8>(data) + ivLength, data.count - ivLength,
                            &clearData, clearLength,
                            &numBytesDecrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        clearData.removeRange(numBytesDecrypted..<clearLength)

    } else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return clearData;
}
```

```
func aesCBC128Encrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)
    let cryptDataLength = size_t(data.count + kCCBlockSizeAES128)
    var cryptData = [UInt8](count:ivLength + cryptDataLength, repeatedValue:0)

    let status = SecRandomCopyBytes(kSecRandomDefault, Int(ivLength),
UnsafeMutablePointer<UInt8>(cryptData));
    if (status != 0) {
        print("IV Error, errno: \(status)")
        return nil
    }
```

```
    var numBytesEncrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCEncrypt),
                              CCAlgorithm(kCCAlgorithmAES128),
                              CCOptions(kCCOptionPKCS7Padding),
                              keyData, keyLength,
                              cryptData,
                              data, data.count,
                              &cryptData + ivLength, cryptDataLength,
                              &numBytesEncrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.removeRange(numBytesEncrypted+ivLength..<cryptData.count)
    }
    else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return cryptData;
}

func aesCBC128Decrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let clearLength = size_t(data.count)
    var clearData   = [UInt8](count:clearLength, repeatedValue:0)

    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)

    var numBytesDecrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCDecrypt),
                              CCAlgorithm(kCCAlgorithmAES128),
                              CCOptions(kCCOptionPKCS7Padding),
                              keyData, keyLength,
                              data,
                              UnsafePointer<UInt8>(data) + ivLength, data.count - ivLength,
                              &clearData, clearLength,
                              &numBytesDecrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        clearData.removeRange(numBytesDecrypted..<clearLength)

    } else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return clearData;
}
```

```
func aesCBC128Encrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)
    let cryptDataLength = size_t(data.count + kCCBlockSizeAES128)
    var cryptData = [UInt8](count:ivLength + cryptDataLength, repeatedValue:0)

    let status = SecRandomCopyBytes(kSecRandomDefault, Int(ivLength),
UnsafeMutablePointer<UInt8>(cryptData));
    if (status != 0) {
        print("IV Error, errno: \(status)")
        return nil
```

```
    }

    var numBytesEncrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCEncrypt),
                              CCAlgorithm(kCCAlgorithmAES128),
                              CCOptions(kCCOptionPKCS7Padding),
                              keyData, keyLength,
                              cryptData,
                              data, data.count,
                              &cryptData + ivLength, cryptDataLength,
                              &numBytesEncrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        cryptData.removeRange(numBytesEncrypted+ivLength..<cryptData.count)
    }
    else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return cryptData;
}

func aesCBC128Decrypt(data data:[UInt8], keyData:[UInt8]) -> [UInt8]? {
    let clearLength = size_t(data.count)
    var clearData   = [UInt8](count:clearLength, repeatedValue:0)

    let keyLength   = size_t(kCCKeySizeAES128)
    let ivLength    = size_t(kCCBlockSizeAES128)

    var numBytesDecrypted :size_t = 0
    let cryptStatus = CCCrypt(CCOperation(kCCDecrypt),
                              CCAlgorithm(kCCAlgorithmAES128),
                              CCOptions(kCCOptionPKCS7Padding),
                              keyData, keyLength,
                              data,
                              UnsafePointer<UInt8>(data) + ivLength, data.count - ivLength,
                              &clearData, clearLength,
                              &numBytesDecrypted)

    if UInt32(cryptStatus) == UInt32(kCCSuccess) {
        clearData.removeRange(numBytesDecrypted..<clearLength)

    } else {
        print("Error: \(cryptStatus)")
        return nil;
    }

    return clearData;
}
```

PKCS7ECBAES

AppleIV

ECB。

```
func AESEncryption(key: String) -> String? {
```

```
        let keyData: NSData! = (key as NSString).data(using: String.Encoding.utf8.rawValue) as
NSData!

        let data: NSData! = (self as NSString).data(using: String.Encoding.utf8.rawValue) as
NSData!

        let cryptData    = NSMutableData(length: Int(data.length) + kCCBlockSizeAES128)!

        let keyLength              = size_t(kCCKeySizeAES128)
        let operation: CCOperation = UInt32(kCCEncrypt)
        let algoritm:  CCAlgorithm = UInt32(kCCAlgorithmAES128)
        let options:   CCOptions   = UInt32(kCCOptionECBMode + kCCOptionPKCS7Padding)

        var numBytesEncrypted :size_t = 0


        let cryptStatus = CCCrypt(operation,
                                  algoritm,
                                  options,
                                  keyData.bytes, keyLength,
                                  nil,
                                  data.bytes, data.length,
                                  cryptData.mutableBytes, cryptData.length,
                                  &numBytesEncrypted)

        if UInt32(cryptStatus) == UInt32(kCCSuccess) {
            cryptData.length = Int(numBytesEncrypted)

            var bytes = [UInt8](repeating: 0, count: cryptData.length)
            cryptData.getBytes(&bytes, length: cryptData.length)

            var hexString = ""
            for byte in bytes {
                hexString += String(format:"%02x", UInt8(byte))
            }

            return hexString
        }

        return nil
    }
```

AES https://riptutorial.com/zh-TW/swift/topic/7026/aes

4: KituraSwift HTTP

`KituraKitura`

`Kitura`swiftWebWeb。 HTTP。 XCodeOS Xswift 3.0Linux。

Examples

Package.swift。 swift。 hello worldGitHub repos。 `KituraHeliumLogger` 。 Package.swift。 *kitura-helloworld*URL。

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

Sources。 main.swift。 。 。

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

RouterHTTP。 GET*Hello world* post。

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

HTTP

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

Package.swiftResources。 。 SwiftPackage.swiftPackagesmain.swift

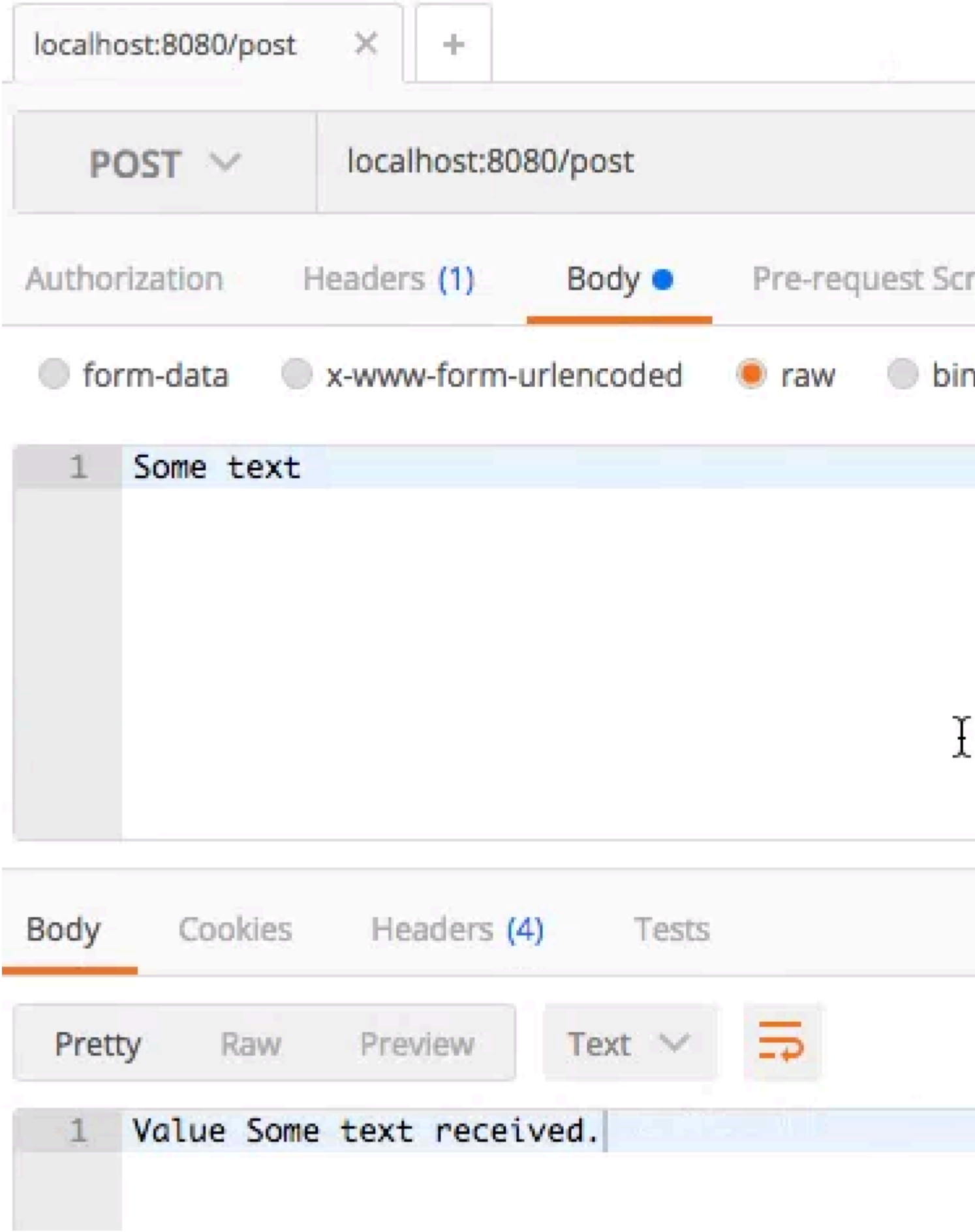
```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

。 。

```
import PackageDescription
let package = Package(
    name: "kitura-helloworld",
        dependencies: [
            .Package(url: "https://github.com/IBM-Swift/HeliumLogger.git", majorVersion: 1,
minor: 6),
            .Package(url: "https://github.com/IBM-Swift/Kitura.git", majorVersion: 1, minor:
6) ] )
```

`localhost:8080/get` as urlEnter。 。

HTTP`localhost:8080/post` ◦ ◦



KituraSwift HTTP https://riptutorial.com/zh-TW/swift/topic/10690/kituraswift-http

5: OptionSet

Examples

OptionSet

OptionSetType。 /

```
struct Features : OptionSet {
  let rawValue : Int
  static let none = Features(rawValue: 0)
  static let feature0 = Features(rawValue: 1 << 0)
  static let feature1 = Features(rawValue: 1 << 1)
  static let feature2 = Features(rawValue: 1 << 2)
  static let feature3 = Features(rawValue: 1 << 3)
  static let feature4 = Features(rawValue: 1 << 4)
  static let feature5 = Features(rawValue: 1 << 5)
  static let all: Features = [feature0, feature1, feature2, feature3, feature4, feature5]
}

Features.feature1.rawValue //2
Features.all.rawValue //63

var options: Features = [.feature1, .feature2, .feature3]

options.contains(.feature1) //true
options.contains(.feature4) //false

options.insert(.feature4)
options.contains(.feature4) //true


var otherOptions : Features = [.feature1, .feature5]

options.contains(.feature5) //false

options.formUnion(otherOptions)
options.contains(.feature5) //true

options.remove(.feature5)
options.contains(.feature5) //false
```

OptionSet https://riptutorial.com/zh-TW/swift/topic/1242/optionset

6: PBKDF2

Examples

2Swift 3

。

SHA1SHA256SHA512。

rounds。 100ms500ms。

Common Crypto

`#import <CommonCrypto/CommonCrypto.h>`

`Security.framework`。

```
password     password String
salt         salt Data
keyByteCount number of key bytes to generate
rounds       Iteration rounds

returns      Derived key


func pbkdf2SHA1(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA256(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA512(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: Data, keyByteCount: Int, rounds:
Int) -> Data? {
    let passwordData = password.data(using:String.Encoding.utf8)!
    var derivedKeyData = Data(repeating:0, count:keyByteCount)

    let derivationStatus = derivedKeyData.withUnsafeMutableBytes {derivedKeyBytes in
        salt.withUnsafeBytes { saltBytes in

            CCKeyDerivationPBKDF(
                CCPBKDFAlgorithm(kCCPBKDF2),
                password, passwordData.count,
                saltBytes, salt.count,
                hash,
                UInt32(rounds),
```

```
                derivedKeyBytes, derivedKeyData.count)
        }
    }
    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKeyData
}
```

```
password     password String
salt         salt Data
keyByteCount number of key bytes to generate
rounds       Iteration rounds

returns      Derived key


func pbkdf2SHA1(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA256(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA512(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: Data, keyByteCount: Int, rounds:
Int) -> Data? {
    let passwordData = password.data(using:String.Encoding.utf8)!
    var derivedKeyData = Data(repeating:0, count:keyByteCount)

    let derivationStatus = derivedKeyData.withUnsafeMutableBytes {derivedKeyBytes in
        salt.withUnsafeBytes { saltBytes in

            CCKeyDerivationPBKDF(
                CCPBKDFAlgorithm(kCCPBKDF2),
                password, passwordData.count,
                saltBytes, salt.count,
                hash,
                UInt32(rounds),
                derivedKeyBytes, derivedKeyData.count)
        }
    }
    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKeyData
}
```

```
password     password String
salt         salt Data
keyByteCount number of key bytes to generate
rounds       Iteration rounds

returns      Derived key


func pbkdf2SHA1(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA256(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2SHA512(password: String, salt: Data, keyByteCount: Int, rounds: Int) -> Data? {
    return pbkdf2(hash:CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyByteCount:keyByteCount, rounds:rounds)
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: Data, keyByteCount: Int, rounds:
Int) -> Data? {
    let passwordData = password.data(using:String.Encoding.utf8)!
    var derivedKeyData = Data(repeating:0, count:keyByteCount)

    let derivationStatus = derivedKeyData.withUnsafeMutableBytes {derivedKeyBytes in
        salt.withUnsafeBytes { saltBytes in

            CCKeyDerivationPBKDF(
                CCPBKDFAlgorithm(kCCPBKDF2),
                password, passwordData.count,
                saltBytes, salt.count,
                hash,
                UInt32(rounds),
                derivedKeyBytes, derivedKeyData.count)
        }
    }
    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKeyData
}
```

2Swift 2.3

Swift 3

```
func pbkdf2SHA1(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA256(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
```

```
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA512(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: [UInt8], keyCount: Int, rounds:
UInt32!) -> [UInt8]! {
    let derivedKey   = [UInt8](count:keyCount, repeatedValue:0)
    let passwordData = password.dataUsingEncoding(NSUTF8StringEncoding)!

    let derivationStatus = CCKeyDerivationPBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        UnsafePointer<Int8>(passwordData.bytes), passwordData.length,
        UnsafePointer<UInt8>(salt), salt.count,
        CCPseudoRandomAlgorithm(hash),
        rounds,
        UnsafeMutablePointer<UInt8>(derivedKey),
        derivedKey.count)


    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKey
}
```

```
func pbkdf2SHA1(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA256(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA512(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: [UInt8], keyCount: Int, rounds:
UInt32!) -> [UInt8]! {
    let derivedKey   = [UInt8](count:keyCount, repeatedValue:0)
    let passwordData = password.dataUsingEncoding(NSUTF8StringEncoding)!

    let derivationStatus = CCKeyDerivationPBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        UnsafePointer<Int8>(passwordData.bytes), passwordData.length,
        UnsafePointer<UInt8>(salt), salt.count,
        CCPseudoRandomAlgorithm(hash),
        rounds,
        UnsafeMutablePointer<UInt8>(derivedKey),
        derivedKey.count)
```

```
    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKey
}
```

```
func pbkdf2SHA1(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA1), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA256(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA256), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2SHA512(password: String, salt: [UInt8], keyCount: Int, rounds: Int) -> [UInt8]? {
    return pbkdf2(CCPBKDFAlgorithm(kCCPRFHmacAlgSHA512), password:password, salt:salt,
keyCount:keyCount, rounds:UInt32(rounds))
}

func pbkdf2(hash :CCPBKDFAlgorithm, password: String, salt: [UInt8], keyCount: Int, rounds:
UInt32!) -> [UInt8]! {
    let derivedKey   = [UInt8](count:keyCount, repeatedValue:0)
    let passwordData = password.dataUsingEncoding(NSUTF8StringEncoding)!

    let derivationStatus = CCKeyDerivationPBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        UnsafePointer<Int8>(passwordData.bytes), passwordData.length,
        UnsafePointer<UInt8>(salt), salt.count,
        CCPseudoRandomAlgorithm(hash),
        rounds,
        UnsafeMutablePointer<UInt8>(derivedKey),
        derivedKey.count)


    if (derivationStatus != 0) {
        print("Error: \(derivationStatus)")
        return nil;
    }

    return derivedKey
}
```

Swift 2.3

Swift 3

```
func pbkdf2SHA1Calibrate(password:String, salt:[UInt8], msec:Int) -> UInt32 {
    let actualRoundCount: UInt32 = CCCalibratePBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        password.utf8.count,
        salt.count,
        CCPseudoRandomAlgorithm(kCCPRFHmacAlgSHA1),
        kCCKeySizeAES256,
```

```
        UInt32(msec));
    return actualRoundCount
}
```

```
func pbkdf2SHA1Calibrate(password:String, salt:[UInt8], msec:Int) -> UInt32 {
    let actualRoundCount: UInt32 = CCCalibratePBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        password.utf8.count,
        salt.count,
        CCPseudoRandomAlgorithm(kCCPRFHmacAlgSHA1),
        kCCKeySizeAES256,
        UInt32(msec));
    return actualRoundCount
}
```

10094339

Swift 3

PRF。

。

```
password Sample password.
salt     Sample salt.
msec     Targeted duration we want to achieve for a key derivation.

returns  The number of iterations to use for the desired processing time.


func pbkdf2SHA1Calibrate(password: String, salt: Data, msec: Int) -> UInt32 {
    let actualRoundCount: UInt32 = CCCalibratePBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        password.utf8.count,
        salt.count,
        CCPseudoRandomAlgorithm(kCCPRFHmacAlgSHA1),
        kCCKeySizeAES256,
        UInt32(msec));
    return actualRoundCount
}
```

```
password Sample password.
salt     Sample salt.
msec     Targeted duration we want to achieve for a key derivation.

returns  The number of iterations to use for the desired processing time.


func pbkdf2SHA1Calibrate(password: String, salt: Data, msec: Int) -> UInt32 {
    let actualRoundCount: UInt32 = CCCalibratePBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        password.utf8.count,
        salt.count,
        CCPseudoRandomAlgorithm(kCCPRFHmacAlgSHA1),
        kCCKeySizeAES256,
        UInt32(msec));
```

```
    return actualRoundCount
}
```

```
password Sample password.
salt     Sample salt.
msec     Targeted duration we want to achieve for a key derivation.

returns  The number of iterations to use for the desired processing time.


func pbkdf2SHA1Calibrate(password: String, salt: Data, msec: Int) -> UInt32 {
    let actualRoundCount: UInt32 = CCCalibratePBKDF(
        CCPBKDFAlgorithm(kCCPBKDF2),
        password.utf8.count,
        salt.count,
        CCPseudoRandomAlgorithm(kCCPRFHmacAlgSHA1),
        kCCKeySizeAES256,
        UInt32(msec));
    return actualRoundCount
}
```

PBKDF2 https://riptutorial.com/zh-TW/swift/topic/7053/pbkdf2

7: RxSwift

Examples

RxSwift

FRP。

Observable。 FRP Observable。

Observable - .Next .Success .Error。

```
--(1)--(2)--(3)|-->
```

Int。 .Next。

```
--(1)--(2)--(3)|-->
```

.ErrorObservable。

1. RxSwift。 。
2. RxSwift Slack。
3. RxMarbles。
4. 。

*RxSwift*Observable

```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
let doubleObservale = Observable.just(3.14) // Observable<Double>
```

。 。 。

Observable。

```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
let doubleObservale = Observable.just(3.14) // Observable<Double>
```

```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
```

```
let doubleObservale = Observable.just(3.14) // Observable<Double>
```

.NextsubscribeNext

```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
let doubleObservale = Observable.just(3.14) // Observable<Double>
```


```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
let doubleObservale = Observable.just(3.14) // Observable<Double>
```


Observable。 Observable<SomeResultType>。


```
import RxSwift

let intObservale = Observable.just(123) // Observable<Int>
let stringObservale = Observable.just("RxSwift") // Observable<String>
let doubleObservale = Observable.just(3.14) // Observable<Double>
```


。

addDisposableTodisposeBagdispose。 。

。

1. disposeBagaddDisposableTo。
2. takeUntil。

DisposeBag。

```
let bag = DisposeBag()
Observable.just(1).subscribeNext {
    print($0)
}.addDisposableTo(bag)
```

DisposeBag *RxSwift*NSObject + Rx。


```
let bag = DisposeBag()
Observable.just(1).subscribeNext {
    print($0)
}.addDisposableTo(bag)
```


selftakeUntil(rx_deallocated)

```
let bag = DisposeBag()
Observable.just(1).subscribeNext {
    print($0)
```

```
}.addDisposableTo(bag)
```

```
Observable.combineLatest(firstName.rx_text, lastName.rx_text) { $0 + " " + $1 }
.map { "Greetings, \($0)" }
.bindTo(greetingLabel.rx_text)
```

ObservablescombineLatestObservable。 UITextField"Greetings, \($0)"UILabel。

UITableViewUICollectionView

```
Observable.combineLatest(firstName.rx_text, lastName.rx_text) { $0 + " " + $1 }
.map { "Greetings, \($0)" }
.bindTo(greetingLabel.rx_text)
```

cellForRowAtIndexPathRx。 RxnumberOfRowsAtIndexPath。

RxCocoaControlEvents

RxSwift。

RxCocoa。 UIObservable 。 ControlEventObservable ControlProperties 。 Observable

- 。
- Complete。
- MainScheduler.instance 。

```
button.rx_tap.subscribeNext { _ in   // control event
    print("User tapped the button!")
}.addDisposableTo(bag)

textField.rx_text.subscribeNext { text in // control property
    print("The textfield contains: \(text)")
}.addDisposableTo(bag)
// notice that ControlProperty generates .Next event on subscription
// In this case, the log will display
// "The textfield contains: "
// at the very start of the app.
```

Rx@IBAction。 viewDidLoadUI。

。 。 -

button.rx_tap ControlEvent

```
button.rx_tap.subscribeNext { _ in   // control event
    print("User tapped the button!")
}.addDisposableTo(bag)

textField.rx_text.subscribeNext { text in // control property
    print("The textfield contains: \(text)")
}.addDisposableTo(bag)
// notice that ControlProperty generates .Next event on subscription
```

```
// In this case, the log will display
// "The textfield contains: "
// at the very start of the app.
```

◦ withLatestFromtextFieldwithLatestFrom ◦

```
button.rx_tap.subscribeNext { _ in   // control event
    print("User tapped the button!")
}.addDisposableTo(bag)

textField.rx_text.subscribeNext { text in // control property
    print("The textfield contains: \(text)")
}.addDisposableTo(bag)
// notice that ControlProperty generates .Next event on subscription
// In this case, the log will display
// "The textfield contains: "
// at the very start of the app.
```

◦

Observablemapfiltermap◦ validateEmail◦

```
button.rx_tap.subscribeNext { _ in   // control event
    print("User tapped the button!")
}.addDisposableTo(bag)

textField.rx_text.subscribeNext { text in // control property
    print("The textfield contains: \(text)")
}.addDisposableTo(bag)
// notice that ControlProperty generates .Next event on subscription
// In this case, the log will display
// "The textfield contains: "
// at the very start of the app.
```

.....Bool◦

RxSwift https://riptutorial.com/zh-TW/swift/topic/4890/rxswift

8: Swift Advance

`map` `flatMap` `filter``reduce`ArrayDictionary。 。

Examples

```
struct User {
    var name: String
    var age: Int
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

map。 map。

```
struct User {
    var name: String
    var age: Int
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

。

```
struct User {
    var name: String
    var age: Int
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
```

```
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

filterincludeArray。

```
struct User {
    var name: String
    var age: Int
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

reduce。

Swift 2.3 -

```
struct User {
    var name: String
    var age: Int
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

3 -

```
struct User {
    var name: String
    var age: Int
```

```
    var country: String?
}

//User's information
let user1 = User(name: "John", age: 24, country: "USA")
let user2 = User(name: "Chan", age: 20, country: nil)
let user3 = User(name: "Morgan", age: 30, country: nil)
let user4 = User(name: "Rachel", age: 20, country: "UK")
let user5 = User(name: "Katie", age: 23, country: "USA")
let user6 = User(name: "David", age: 35, country: "USA")
let user7 = User(name: "Bob",age: 22, country: nil)

//User's array list
let arrUser = [user1, user2, user3, user4, user5, user6, user7]
```

flatMap。nil。 -

。 flatMap -

```
let arrStateName = [["Alaska", "Iowa", "Missouri", "New Mexico"], ["New York", "Texas",
"Washington", "Maryland"], ["New Jersey", "Virginia", "Florida", "Colorado"]]
```

```
let arrStateName = [["Alaska", "Iowa", "Missouri", "New Mexico"], ["New York", "Texas",
"Washington", "Maryland"], ["New Jersey", "Virginia", "Florida", "Colorado"]]
```

flatten。

```
let arrStateName = [["Alaska", "Iowa", "Missouri", "New Mexico"], ["New York", "Texas",
"Washington", "Maryland"], ["New Jersey", "Virginia", "Florida", "Colorado"]]
```

Swift Advance https://riptutorial.com/zh-TW/swift/topic/9279/swift-advance

9: SwiftNSRegularExpression

```
*?+[(){}^$|\./
```

Examples

String

```
extension String {
    func matchesPattern(pattern: String) -> Bool {
        do {
            let regex = try NSRegularExpression(pattern: pattern,
                                                options: NSRegularExpressionOptions(rawValue:
0))
            let range: NSRange = NSMakeRange(0, self.characters.count)
            let matches = regex.matchesInString(self, options: NSMatchingOptions(), range:
range)
            return matches.count > 0
        } catch _ {
            return false
        }
    }
}

// very basic examples - check for specific strings
dump("Pinkman".matchesPattern("(White|Pinkman|Goodman|Schrader|Fring)"))

// using character groups to check for similar-sounding impressionist painters
dump("Monet".matchesPattern("(M[oa]net)"))
dump("Manet".matchesPattern("(M[oa]net)"))
dump("Money".matchesPattern("(M[oa]net)"))     // false

// check surname is in list
dump("Skyler White".matchesPattern("\\w+ (White|Pinkman|Goodman|Schrader|Fring)"))

// check if string looks like a UK stock ticker
dump("VOD.L".matchesPattern("[A-Z]{2,3}\\.L"))
dump("BP.L".matchesPattern("[A-Z]{2,3}\\.L"))

// check entire string is printable ASCII characters
dump("tab\tformatted text".matchesPattern("^[\u{0020}-\u{007e}]*$"))

// Unicode example: check if string contains a playing card suit
dump("♠".matchesPattern("[\u{2660}-\u{2667}]"))
dump("♡".matchesPattern("[\u{2660}-\u{2667}]"))
dump("".matchesPattern("[\u{2660}-\u{2667}]"))    // false

// NOTE: regex needs Unicode-escaped characters
dump("♣".matchesPattern("♣"))           // does NOT work
```

。

```
extension String {
    func matchesPattern(pattern: String) -> Bool {
```

```
        do {
            let regex = try NSRegularExpression(pattern: pattern,
                                                options: NSRegularExpressionOptions(rawValue:
0))
            let range: NSRange = NSMakeRange(0, self.characters.count)
            let matches = regex.matchesInString(self, options: NSMatchingOptions(), range:
range)
            return matches.count > 0
        } catch _ {
            return false
        }
    }
}

// very basic examples - check for specific strings
dump("Pinkman".matchesPattern("(White|Pinkman|Goodman|Schrader|Fring)"))

// using character groups to check for similar-sounding impressionist painters
dump("Monet".matchesPattern("(M[oa]net)"))
dump("Manet".matchesPattern("(M[oa]net)"))
dump("Money".matchesPattern("(M[oa]net)"))     // false

// check surname is in list
dump("Skyler White".matchesPattern("\\w+ (White|Pinkman|Goodman|Schrader|Fring)"))

// check if string looks like a UK stock ticker
dump("VOD.L".matchesPattern("[A-Z]{2,3}\\.L"))
dump("BP.L".matchesPattern("[A-Z]{2,3}\\.L"))

// check entire string is printable ASCII characters
dump("tab\tformatted text".matchesPattern("^[\u{0020}-\u{007e}]*$"))

// Unicode example: check if string contains a playing card suit
dump("♠□".matchesPattern("[\u{2660}-\u{2667}]"))
dump("♡".matchesPattern("[\u{2660}-\u{2667}]"))
dump("□".matchesPattern("[\u{2660}-\u{2667}]"))    // false

// NOTE: regex needs Unicode-escaped characters
dump("♣□".matchesPattern("♣□"))           // does NOT work
```

Swift。

```
let letters = "abcdefg"
let pattern = "[a,b,c]"
let regEx = try NSRegularExpression(pattern: pattern, options: [])
let nsString = letters as NSString
let matches = regEx.matches(in: letters, options: [], range: NSMakeRange(0, nsString.length))
let output = matches.map {nsString.substring(with: $0.range)}
//output = ["a", "b", "c"]
```

NSString。

do catch

```
let letters = "abcdefg"
let pattern = "[a,b,c]"
let regEx = try NSRegularExpression(pattern: pattern, options: [])
let nsString = letters as NSString
```

```
let matches = regEx.matches(in: letters, options: [], range: NSMakeRange(0, nsString.length))
let output = matches.map {nsString.substring(with: $0.range)}
//output = ["a", "b", "c"]
```

。

。

。

```
var money = "¢¥€£$¥€£¢"
let pattern = "¢"
do {
    let regEx = try NSRegularExpression (pattern: pattern, options: [])
    let nsString = money as NSString
    let range = NSMakeRange(0, nsString.length)
    let correct$ = regEx.stringByReplacingMatches(in: money, options: .withTransparentBounds,
range: range, withTemplate: "$")
} catch let error as NSError {
    print("Matching failed")
}
//correct$ = "$¥€£$¥€£$"
```

\. becomes \\.

```
(){}[]/\+*$>.|^?
```

```
(){}[]/\+*$>.|^?
```

。

```
var validDate = false

let numbers = "35/12/2016"
let usPattern =  "^(0[1-9]|1[012])[-/.](0[1-9]|[12][0-9]|3[01])[-/.](19|20)\\d\\d$"
let ukPattern = "^(0[1-9]|[12][0-9]|3[01])[-/](0[1-9]|1[012])[-/](19|20)\\d\\d$"
do {
    let regEx = try NSRegularExpression(pattern: ukPattern, options: [])
    let nsString = numbers as NSString
    let matches = regEx.matches(in: numbers, options: [], range: NSMakeRange(0,
nsString.length))

    if matches.count > 0 {
        validDate = true
    }

    validDate

} catch let error as NSError {
    print("Matching failed")
}
//output = false
```

NSRegularExpression

```
func isValidEmail(email: String) -> Bool {

    let emailRegEx = "[A-Z0-9a-z._%+-]+@[A-Za-z0-9.-]+\\.[A-Za-z]{2,4}"

    let emailTest = NSPredicate(format:"SELF MATCHES %@", emailRegEx)
    return emailTest.evaluate(with: email)
}
```

String

```
func isValidEmail(email: String) -> Bool {

    let emailRegEx = "[A-Z0-9a-z._%+-]+@[A-Za-z0-9.-]+\\.[A-Za-z]{2,4}"

    let emailTest = NSPredicate(format:"SELF MATCHES %@", emailRegEx)
    return emailTest.evaluate(with: email)
}
```

SwiftNSRegularExpression https://riptutorial.com/zh-TW/swift/topic/5763/swiftnsregularexpression

10: Swift

Examples

`Person`

```
struct Person {
    let name: String
    let birthYear: Int?
}
```

`Person(s)`

```
struct Person {
    let name: String
    let birthYear: Int?
}
```

Person`nameString`。

```
struct Person {
    let name: String
    let birthYear: Int?
}
```

```
let numbers = [3, 1, 4, 1, 5]
// non-functional
for (index, element) in numbers.enumerate() {
    print(index, element)
}

// functional
numbers.enumerate().map { (index, element) in
    print((index, element))
}
```

// 。

```
/// Projection
var newReleases = [
    [
        "id": 70111470,
        "title": "Die Hard",
        "boxart": "http://cdn-0.nflximg.com/images/2891/DieHard.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": [4.0],
        "bookmark": []
    ],
    [
        "id": 654356453,
        "title": "Bad Boys",
        "boxart": "http://cdn-0.nflximg.com/images/2891/BadBoys.jpg",
```

```
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": [5.0],
        "bookmark": [[ "id": 432534, "time": 65876586 ]]
    ],
    [
        "id": 65432445,
        "title": "The Chamber",
        "boxart": "http://cdn-0.nflximg.com/images/2891/TheChamber.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": [4.0],
        "bookmark": []
    ],
    [
        "id": 675465,
        "title": "Fracture",
        "boxart": "http://cdn-0.nflximg.com/images/2891/Fracture.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": [5.0],
        "bookmark": [[ "id": 432534, "time": 65876586 ]]
    ]
]


var videoAndTitlePairs = [[String: AnyObject]]()
newReleases.map { e in
    videoAndTitlePairs.append(["id": e["id"] as! Int, "title": e["title"] as! String])
}

print(videoAndTitlePairs)
```

```
var newReleases = [
    [
        "id": 70111470,
        "title": "Die Hard",
        "boxart": "http://cdn-0.nflximg.com/images/2891/DieHard.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": 4.0,
        "bookmark": []
    ],
    [
        "id": 654356453,
        "title": "Bad Boys",
        "boxart": "http://cdn-0.nflximg.com/images/2891/BadBoys.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": 5.0,
        "bookmark": [[ "id": 432534, "time": 65876586 ]]
    ],
    [
        "id": 65432445,
        "title": "The Chamber",
        "boxart": "http://cdn-0.nflximg.com/images/2891/TheChamber.jpg",
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": 4.0,
        "bookmark": []
    ],
    [
        "id": 675465,
        "title": "Fracture",
        "boxart": "http://cdn-0.nflximg.com/images/2891/Fracture.jpg",
```

```
        "uri": "http://api.netflix.com/catalog/titles/movies/70111470",
        "rating": 5.0,
        "bookmark": [[ "id": 432534, "time": 65876586 ]]
    ]
]

var videos1 = [[String: AnyObject]]()
/**
 *  Filtering using map
 */
newReleases.map { e in
    if e["rating"] as! Float == 5.0 {
        videos1.append(["id": e["id"] as! Int, "title": e["title"] as! String])
    }
}

print(videos1)

var videos2 = [[String: AnyObject]]()
/**
 *  Filtering using filter and chaining
 */
newReleases
    .filter{ e in
        e["rating"] as! Float == 5.0
    }
    .map { e in
    videos2.append(["id": e["id"] as! Int, "title": e["title"] as! String])
}

print(videos2)
```

- Swift。 。

```
struct Painter {
    enum Type { case Impressionist, Expressionist, Surrealist, Abstract, Pop }
    var firstName: String
    var lastName: String
    var type: Type
}

let painters = [
    Painter(firstName: "Claude", lastName: "Monet", type: .Impressionist),
    Painter(firstName: "Edgar", lastName: "Degas", type: .Impressionist),
    Painter(firstName: "Egon", lastName: "Schiele", type: .Expressionist),
    Painter(firstName: "George", lastName: "Grosz", type: .Expressionist),
    Painter(firstName: "Mark", lastName: "Rothko", type: .Abstract),
    Painter(firstName: "Jackson", lastName: "Pollock", type: .Abstract),
    Painter(firstName: "Pablo", lastName: "Picasso", type: .Surrealist),
    Painter(firstName: "Andy", lastName: "Warhol", type: .Pop)
]

// list the expressionists
dump(painters.filter({$0.type == .Expressionist}))

// count the expressionists
dump(painters.filter({$0.type == .Expressionist}).count)
// prints "2"

// combine filter and map for more complex operations, for example listing all
```

```
// non-impressionist and non-expressionists by surname
dump(painters.filter({$0.type != .Impressionist && $0.type != .Expressionist})
    .map({$0.lastName}).joinWithSeparator(", "))
// prints "Rothko, Pollock, Picasso, Warhol"
```

Swift https://riptutorial.com/zh-TW/swift/topic/2948/swift

11: Swift

Examples

Swift

Swift

```
mkdir AwesomeProject
cd AwesomeProject
```

Git

```
mkdir AwesomeProject
cd AwesomeProject
```

- CLI。

```
mkdir AwesomeProject
cd AwesomeProject
```

- *main.swift*。

```
mkdir AwesomeProject
cd AwesomeProject
```

AwesomeProject.swift。

*Sources*Swift。

Package.swift

```
mkdir AwesomeProject
cd AwesomeProject
```

Git

```
mkdir AwesomeProject
cd AwesomeProject
```

Git。

```
mkdir AwesomeProject
cd AwesomeProject
```

.build / debug。

- “SomeOtherPackage”*Package.swift*

```
mkdir AwesomeProject
cd AwesomeProject
```

Swift Package Manager。

Swift https://riptutorial.com/zh-TW/swift/topic/5144/swift

12: Swift

。 。 。

Examples

。 。 。 On2。 。

```
extension Array where Element: Comparable {

func insertionSort() -> Array<Element> {

    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryindex in 0..<output.count {

        let key = output[primaryindex]
        var secondaryindex = primaryindex

        while secondaryindex > -1 {
            if key < output[secondaryindex] {

                //move to correct position
                output.remove(at: secondaryindex + 1)
                output.insert(key, at: secondaryindex)
            }
            secondaryindex -= 1
        }
    }

    return output
}
}
```

。 。 。 On2。

```
extension Array where Element: Comparable {

func bubbleSort() -> Array<Element> {

    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryIndex in 0..<self.count {
```

```
        let passes = (output.count - 1) - primaryIndex

        //"half-open" range operator
        for secondaryIndex in 0..<passes {
            let key = output[secondaryIndex]

            //compare / swap positions
            if (key > output[secondaryIndex + 1]) {
                swap(&output[secondaryIndex], &output[secondaryIndex + 1])
            }
        }
    }

    return output
}

}
```

。 。 。 On2。 。

```
extension Array where Element: Comparable {

func bubbleSort() -> Array<Element> {

    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryIndex in 0..<self.count {
        let passes = (output.count - 1) - primaryIndex

        //"half-open" range operator
        for secondaryIndex in 0..<passes {
            let key = output[secondaryIndex]

            //compare / swap positions
            if (key > output[secondaryIndex + 1]) {
                swap(&output[secondaryIndex], &output[secondaryIndex + 1])
            }
        }
    }

    return output
}

}
```

。 。 minmin。 。 On2 - 。

func selectionSort - > Array {//self.count> 1 else {return self}

```
extension Array where Element: Comparable {

func bubbleSort() -> Array<Element> {
```

```
    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryIndex in 0..<self.count {
        let passes = (output.count - 1) - primaryIndex

        //"half-open" range operator
        for secondaryIndex in 0..<passes {
            let key = output[secondaryIndex]

            //compare / swap positions
            if (key > output[secondaryIndex + 1]) {
                swap(&output[secondaryIndex], &output[secondaryIndex + 1])
            }
        }
    }

    return output
}

}
```

- On log n

Quicksort。 On log n。 。 Quicksort。 Quicksort。

pivot。

pivotpivotpivot。 。 。

。

mutating func quickSort - > Array {

```
extension Array where Element: Comparable {

func bubbleSort() -> Array<Element> {

    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryIndex in 0..<self.count {
        let passes = (output.count - 1) - primaryIndex

        //"half-open" range operator
        for secondaryIndex in 0..<passes {
            let key = output[secondaryIndex]
```

```
            //compare / swap positions
            if (key > output[secondaryIndex + 1]) {
                swap(&output[secondaryIndex], &output[secondaryIndex + 1])
            }
        }
    }

    return output
}

}
```

。 。 minmin。 。 On2 - 。

```
func selectionSort() -> Array<Element> {
    //check for trivial case
    guard self.count > 1 else {
        return self
    }

    //mutated copy
    var output: Array<Element> = self

    for primaryindex in 0..<output.count {
        var minimum = primaryindex
        var secondaryindex = primaryindex + 1

        while secondaryindex < output.count {
            //store lowest value as minimum
            if output[minimum] > output[secondaryindex] {
                minimum = secondaryindex
            }
            secondaryindex += 1
        }

        //swap minimum value with array iteration
        if primaryindex != minimum {
            swap(&output[primaryindex], &output[minimum])
        }
    }

    return output
}
```

。 。 。 n。 Big O Notation。

- **On** 。 。
- **On2** nn。 。 On2On3.....
- **Olog n**n。 。

- On log n

Quicksort。 On log n。 。 Quicksort。 Quicksort。

1. pivot。

2. pivotpivotpivot。 。 。

3. 。

```
mutating func quickSort() -> Array<Element> {

func qSort(start startIndex: Int, _ pivot: Int) {

    if (startIndex < pivot) {
        let iPivot = qPartition(start: startIndex, pivot)
        qSort(start: startIndex, iPivot - 1)
        qSort(start: iPivot + 1, pivot)
    }
}
qSort(start: 0, self.endIndex - 1)
return self
```

}

mutating func qPartitionstart startIndexInt_ pivotInt - > Int {

```
mutating func quickSort() -> Array<Element> {

func qSort(start startIndex: Int, _ pivot: Int) {

    if (startIndex < pivot) {
        let iPivot = qPartition(start: startIndex, pivot)
        qSort(start: startIndex, iPivot - 1)
        qSort(start: iPivot + 1, pivot)
    }
}
qSort(start: 0, self.endIndex - 1)
return self
```

```
mutating func quickSort() -> Array<Element> {

func qSort(start startIndex: Int, _ pivot: Int) {

    if (startIndex < pivot) {
        let iPivot = qPartition(start: startIndex, pivot)
        qSort(start: startIndex, iPivot - 1)
        qSort(start: iPivot + 1, pivot)
    }
}
qSort(start: 0, self.endIndex - 1)
return self
```

。 。 。 。 。

```
//
//  GraphFactory.swift
//  SwiftStructures
//
//  Created by Wayne Bishop on 6/7/14.
//  Copyright (c) 2014 Arbutus Software Inc. All rights reserved.
//
```

```
import Foundation


public class SwiftGraph {


    //declare a default directed graph canvas
    private var canvas: Array<Vertex>
    public var isDirected: Bool


    init() {
        canvas = Array<Vertex>()
        isDirected = true
    }


    //create a new vertex
    func addVertex(key: String) -> Vertex {


        //set the key
        let childVertex: Vertex = Vertex()
        childVertex.key = key


        //add the vertex to the graph canvas
        canvas.append(childVertex)


        return childVertex
    }



    //add edge to source vertex
    func addEdge(source: Vertex, neighbor: Vertex, weight: Int) {


        //create a new edge
        let newEdge = Edge()


        //establish the default properties
        newEdge.neighbor = neighbor
        newEdge.weight = weight
        source.neighbors.append(newEdge)


        print("The neighbor of vertex: \(source.key as String!) is \(neighbor.key as
String!)..")


        //check condition for an undirected graph
        if isDirected == false {


           //create a new reversed edge
           let reverseEdge = Edge()
```

```
            //establish the reversed properties
            reverseEdge.neighbor = source
            reverseEdge.weight = weight
            neighbor.neighbors.append(reverseEdge)

            print("The neighbor of vertex: \(neighbor.key as String!) is \(source.key as
String!)..")

        }


    }





    /* reverse the sequence of paths given the shortest path.
       process analagous to reversing a linked list. */

    func reversePath(_ head: Path!, source: Vertex) -> Path! {


        guard head != nil else {
            return head
        }

        //mutated copy
        var output = head


        var current: Path! = output
        var prev: Path!
        var next: Path!


        while(current != nil) {
            next = current.previous
            current.previous = prev
            prev = current
            current = next
        }


        //append the source path to the sequence
        let sourcePath: Path = Path()

        sourcePath.destination = source
        sourcePath.previous = prev
        sourcePath.total = nil

        output = sourcePath


        return output

    }
```

```
//process Dijkstra's shortest path algorthim
func processDijkstra(_ source: Vertex, destination: Vertex) -> Path? {


    var frontier: Array<Path> = Array<Path>()
    var finalPaths: Array<Path> = Array<Path>()


    //use source edges to create the frontier
    for e in source.neighbors {

        let newPath: Path = Path()


        newPath.destination = e.neighbor
        newPath.previous = nil
        newPath.total = e.weight


        //add the new path to the frontier
        frontier.append(newPath)

    }


    //construct the best path
    var bestPath: Path = Path()


    while frontier.count != 0 {

        //support path changes using the greedy approach
        bestPath = Path()
        var pathIndex: Int = 0


        for x in 0..<frontier.count {

            let itemPath: Path = frontier[x]

            if  (bestPath.total == nil) || (itemPath.total < bestPath.total) {
                bestPath = itemPath
                pathIndex = x
            }

        }



        //enumerate the bestPath edges
        for e in bestPath.destination.neighbors {

            let newPath: Path = Path()

            newPath.destination = e.neighbor
            newPath.previous = bestPath
            newPath.total = bestPath.total + e.weight


            //add the new path to the frontier
            frontier.append(newPath)
```

```
        }


        //preserve the bestPath
        finalPaths.append(bestPath)


        //remove the bestPath from the frontier
        //frontier.removeAtIndex(pathIndex) - Swift2
        frontier.remove(at: pathIndex)



    } //end while



    //establish the shortest path as an optional
    var shortestPath: Path! = Path()


    for itemPath in finalPaths {

        if (itemPath.destination.key == destination.key) {

            if  (shortestPath.total == nil) || (itemPath.total < shortestPath.total) {
                shortestPath = itemPath
            }

        }

    }


    return shortestPath

}



///an optimized version of Dijkstra's shortest path algorthim
func processDijkstraWithHeap(_ source: Vertex, destination: Vertex) -> Path! {


    let frontier: PathHeap = PathHeap()
    let finalPaths: PathHeap = PathHeap()


    //use source edges to create the frontier
    for e in source.neighbors {

        let newPath: Path = Path()


        newPath.destination = e.neighbor
        newPath.previous = nil
        newPath.total = e.weight


        //add the new path to the frontier
```

```
            frontier.enQueue(newPath)

        }


        //construct the best path
        var bestPath: Path = Path()


        while frontier.count != 0 {

            //use the greedy approach to obtain the best path
            bestPath = Path()
            bestPath = frontier.peek()


            //enumerate the bestPath edges
            for e in bestPath.destination.neighbors {

                let newPath: Path = Path()

                newPath.destination = e.neighbor
                newPath.previous = bestPath
                newPath.total = bestPath.total + e.weight


                //add the new path to the frontier
                frontier.enQueue(newPath)

            }


            //preserve the bestPaths that match destination
            if (bestPath.destination.key == destination.key) {
                finalPaths.enQueue(bestPath)
            }


            //remove the bestPath from the frontier
            frontier.deQueue()


        } //end while



        //obtain the shortest path from the heap
        var shortestPath: Path! = Path()
        shortestPath = finalPaths.peek()


        return shortestPath

    }


    //MARK: traversal algorithms


    //bfs traversal with inout closure function
    func traverse(_ startingv: Vertex, formula: (_ node: inout Vertex) -> ()) {
```

```
    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        var vitem: Vertex = graphQueue.deQueue() as Vertex!


        //add unvisited vertices to the queue
        for e in vitem.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        /*
        notes: this demonstrates how to invoke a closure with an inout parameter.
        By passing by reference no return value is required.
        */

        //invoke formula
        formula(&vitem)


    } //end while


    print("graph traversal complete..")


}




//breadth first search
func traverse(_ startingv: Vertex) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        let vitem = graphQueue.deQueue() as Vertex!
```

```
        guard vitem != nil else {
            return
        }

        //add unvisited vertices to the queue
        for e in vitem!.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        vitem!.visited = true
        print("traversed vertex: \(vitem!.key!)..")


    } //end while


    print("graph traversal complete..")


} //end function



//use bfs with trailing closure to update all values
func update(startingv: Vertex, formula:((Vertex) -> Bool)) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        let vitem = graphQueue.deQueue() as Vertex!

        guard vitem != nil else {
            return
        }

        //add unvisited vertices to the queue
        for e in vitem!.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        //apply formula..
        if formula(vitem!) == false {
            print("formula unable to update: \(vitem!.key)")
```

```
            }
            else {
                print("traversed vertex: \(vitem!.key!)..")
            }

            vitem!.visited = true


        } //end while


        print("graph traversal complete..")


    }





}
```

trie - ◦

```
//
//  GraphFactory.swift
//  SwiftStructures
//
//  Created by Wayne Bishop on 6/7/14.
//  Copyright (c) 2014 Arbutus Software Inc. All rights reserved.
//
import Foundation


public class SwiftGraph {


    //declare a default directed graph canvas
    private var canvas: Array<Vertex>
    public var isDirected: Bool


    init() {
        canvas = Array<Vertex>()
        isDirected = true
    }


    //create a new vertex
    func addVertex(key: String) -> Vertex {


        //set the key
        let childVertex: Vertex = Vertex()
        childVertex.key = key


        //add the vertex to the graph canvas
        canvas.append(childVertex)
```

```
        return childVertex
    }



    //add edge to source vertex
    func addEdge(source: Vertex, neighbor: Vertex, weight: Int) {


        //create a new edge
        let newEdge = Edge()


        //establish the default properties
        newEdge.neighbor = neighbor
        newEdge.weight = weight
        source.neighbors.append(newEdge)


        print("The neighbor of vertex: \(source.key as String!) is \(neighbor.key as
String!)..")


        //check condition for an undirected graph
        if isDirected == false {


           //create a new reversed edge
           let reverseEdge = Edge()


           //establish the reversed properties
           reverseEdge.neighbor = source
           reverseEdge.weight = weight
           neighbor.neighbors.append(reverseEdge)

           print("The neighbor of vertex: \(neighbor.key as String!) is \(source.key as
String!)..")

        }


    }





    /* reverse the sequence of paths given the shortest path.
       process analagous to reversing a linked list. */

    func reversePath(_ head: Path!, source: Vertex) -> Path! {


        guard head != nil else {
            return head
        }

        //mutated copy
        var output = head
```

```
    var current: Path! = output
    var prev: Path!
    var next: Path!


    while(current != nil) {
        next = current.previous
        current.previous = prev
        prev = current
        current = next
    }


    //append the source path to the sequence
    let sourcePath: Path = Path()

    sourcePath.destination = source
    sourcePath.previous = prev
    sourcePath.total = nil

    output = sourcePath


    return output

}




//process Dijkstra's shortest path algorthim
func processDijkstra(_ source: Vertex, destination: Vertex) -> Path? {


    var frontier: Array<Path> = Array<Path>()
    var finalPaths: Array<Path> = Array<Path>()


    //use source edges to create the frontier
    for e in source.neighbors {

        let newPath: Path = Path()


        newPath.destination = e.neighbor
        newPath.previous = nil
        newPath.total = e.weight


        //add the new path to the frontier
        frontier.append(newPath)

    }


    //construct the best path
    var bestPath: Path = Path()
```

```
        while frontier.count != 0 {

            //support path changes using the greedy approach
            bestPath = Path()
            var pathIndex: Int = 0


            for x in 0..<frontier.count {

                let itemPath: Path = frontier[x]

                if  (bestPath.total == nil) || (itemPath.total < bestPath.total) {
                    bestPath = itemPath
                    pathIndex = x
                }

            }



            //enumerate the bestPath edges
            for e in bestPath.destination.neighbors {

                let newPath: Path = Path()

                newPath.destination = e.neighbor
                newPath.previous = bestPath
                newPath.total = bestPath.total + e.weight


                //add the new path to the frontier
                frontier.append(newPath)

            }


            //preserve the bestPath
            finalPaths.append(bestPath)


            //remove the bestPath from the frontier
            //frontier.removeAtIndex(pathIndex) - Swift2
            frontier.remove(at: pathIndex)



        } //end while



        //establish the shortest path as an optional
        var shortestPath: Path! = Path()


        for itemPath in finalPaths {

            if (itemPath.destination.key == destination.key) {

                if  (shortestPath.total == nil) || (itemPath.total < shortestPath.total) {
                    shortestPath = itemPath
                }
```

```
        }

    }


    return shortestPath

}



///an optimized version of Dijkstra's shortest path algorthim
func processDijkstraWithHeap(_ source: Vertex, destination: Vertex) -> Path! {


    let frontier: PathHeap = PathHeap()
    let finalPaths: PathHeap = PathHeap()


    //use source edges to create the frontier
    for e in source.neighbors {

        let newPath: Path = Path()


        newPath.destination = e.neighbor
        newPath.previous = nil
        newPath.total = e.weight


        //add the new path to the frontier
        frontier.enQueue(newPath)

    }


    //construct the best path
    var bestPath: Path = Path()


    while frontier.count != 0 {

        //use the greedy approach to obtain the best path
        bestPath = Path()
        bestPath = frontier.peek()


        //enumerate the bestPath edges
        for e in bestPath.destination.neighbors {

            let newPath: Path = Path()

            newPath.destination = e.neighbor
            newPath.previous = bestPath
            newPath.total = bestPath.total + e.weight


            //add the new path to the frontier
            frontier.enQueue(newPath)
```

```
        }


        //preserve the bestPaths that match destination
        if (bestPath.destination.key == destination.key) {
            finalPaths.enQueue(bestPath)
        }


        //remove the bestPath from the frontier
        frontier.deQueue()


    } //end while



    //obtain the shortest path from the heap
    var shortestPath: Path! = Path()
    shortestPath = finalPaths.peek()


    return shortestPath

}


//MARK: traversal algorithms


//bfs traversal with inout closure function
func traverse(_ startingv: Vertex, formula: (_ node: inout Vertex) -> ()) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        var vitem: Vertex = graphQueue.deQueue() as Vertex!


        //add unvisited vertices to the queue
        for e in vitem.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        /*
        notes: this demonstrates how to invoke a closure with an inout parameter.
        By passing by reference no return value is required.
        */
```

```
        //invoke formula
        formula(&vitem)


    } //end while


    print("graph traversal complete..")


}




//breadth first search
func traverse(_ startingv: Vertex) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        let vitem = graphQueue.deQueue() as Vertex!

        guard vitem != nil else {
            return
        }

        //add unvisited vertices to the queue
        for e in vitem!.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        vitem!.visited = true
        print("traversed vertex: \(vitem!.key!)..")


    } //end while


    print("graph traversal complete..")


} //end function



//use bfs with trailing closure to update all values
```

```
    func update(startingv: Vertex, formula:((Vertex) -> Bool)) {


        //establish a new queue
        let graphQueue: Queue<Vertex> = Queue<Vertex>()


        //queue a starting vertex
        graphQueue.enQueue(startingv)


        while !graphQueue.isEmpty() {

            //traverse the next queued vertex
            let vitem = graphQueue.deQueue() as Vertex!

            guard vitem != nil else {
                return
            }

            //add unvisited vertices to the queue
            for e in vitem!.neighbors {
                if e.neighbor.visited == false {
                    print("adding vertex: \(e.neighbor.key!) to queue..")
                    graphQueue.enQueue(e.neighbor)
                }
            }


            //apply formula..
            if formula(vitem!) == false {
                print("formula unable to update: \(vitem!.key)")
            }
            else {
                print("traversed vertex: \(vitem!.key!)..")
            }

            vitem!.visited = true


        } //end while


        print("graph traversal complete..")


    }




}
```

GitHub

pushpop。LIFO。。

github

```
//
//  GraphFactory.swift
//  SwiftStructures
//
//  Created by Wayne Bishop on 6/7/14.
//  Copyright (c) 2014 Arbutus Software Inc. All rights reserved.
//
import Foundation


public class SwiftGraph {


    //declare a default directed graph canvas
    private var canvas: Array<Vertex>
    public var isDirected: Bool


    init() {
        canvas = Array<Vertex>()
        isDirected = true
    }


    //create a new vertex
    func addVertex(key: String) -> Vertex {


        //set the key
        let childVertex: Vertex = Vertex()
        childVertex.key = key


        //add the vertex to the graph canvas
        canvas.append(childVertex)


        return childVertex
    }



    //add edge to source vertex
    func addEdge(source: Vertex, neighbor: Vertex, weight: Int) {


        //create a new edge
        let newEdge = Edge()


        //establish the default properties
        newEdge.neighbor = neighbor
        newEdge.weight = weight
        source.neighbors.append(newEdge)


        print("The neighbor of vertex: \(source.key as String!) is \(neighbor.key as
String!)..")


        //check condition for an undirected graph
```

```
        if isDirected == false {


           //create a new reversed edge
           let reverseEdge = Edge()


           //establish the reversed properties
           reverseEdge.neighbor = source
           reverseEdge.weight = weight
           neighbor.neighbors.append(reverseEdge)

           print("The neighbor of vertex: \(neighbor.key as String!) is \(source.key as
String!)..")

        }


    }





    /* reverse the sequence of paths given the shortest path.
       process analagous to reversing a linked list. */

    func reversePath(_ head: Path!, source: Vertex) -> Path! {


        guard head != nil else {
            return head
        }

        //mutated copy
        var output = head


        var current: Path! = output
        var prev: Path!
        var next: Path!


        while(current != nil) {
            next = current.previous
            current.previous = prev
            prev = current
            current = next
        }


        //append the source path to the sequence
        let sourcePath: Path = Path()

        sourcePath.destination = source
        sourcePath.previous = prev
        sourcePath.total = nil

        output = sourcePath
```

```
        return output

    }




    //process Dijkstra's shortest path algorthim
    func processDijkstra(_ source: Vertex, destination: Vertex) -> Path? {


        var frontier: Array<Path> = Array<Path>()
        var finalPaths: Array<Path> = Array<Path>()


        //use source edges to create the frontier
        for e in source.neighbors {

            let newPath: Path = Path()


            newPath.destination = e.neighbor
            newPath.previous = nil
            newPath.total = e.weight


            //add the new path to the frontier
            frontier.append(newPath)

        }


        //construct the best path
        var bestPath: Path = Path()


        while frontier.count != 0 {

            //support path changes using the greedy approach
            bestPath = Path()
            var pathIndex: Int = 0


            for x in 0..<frontier.count {

                let itemPath: Path = frontier[x]

                if  (bestPath.total == nil) || (itemPath.total < bestPath.total) {
                    bestPath = itemPath
                    pathIndex = x
                }

            }



            //enumerate the bestPath edges
            for e in bestPath.destination.neighbors {

                let newPath: Path = Path()
```

```
            newPath.destination = e.neighbor
            newPath.previous = bestPath
            newPath.total = bestPath.total + e.weight


            //add the new path to the frontier
            frontier.append(newPath)

        }


        //preserve the bestPath
        finalPaths.append(bestPath)


        //remove the bestPath from the frontier
        //frontier.removeAtIndex(pathIndex) - Swift2
        frontier.remove(at: pathIndex)



    } //end while



    //establish the shortest path as an optional
    var shortestPath: Path! = Path()


    for itemPath in finalPaths {

        if (itemPath.destination.key == destination.key) {

            if  (shortestPath.total == nil) || (itemPath.total < shortestPath.total) {
                shortestPath = itemPath
            }

        }

    }


    return shortestPath

}



///an optimized version of Dijkstra's shortest path algorthim
func processDijkstraWithHeap(_ source: Vertex, destination: Vertex) -> Path! {


    let frontier: PathHeap = PathHeap()
    let finalPaths: PathHeap = PathHeap()


    //use source edges to create the frontier
    for e in source.neighbors {

        let newPath: Path = Path()
```

```
        newPath.destination = e.neighbor
        newPath.previous = nil
        newPath.total = e.weight


        //add the new path to the frontier
        frontier.enQueue(newPath)

    }


    //construct the best path
    var bestPath: Path = Path()


    while frontier.count != 0 {

        //use the greedy approach to obtain the best path
        bestPath = Path()
        bestPath = frontier.peek()


        //enumerate the bestPath edges
        for e in bestPath.destination.neighbors {

            let newPath: Path = Path()

            newPath.destination = e.neighbor
            newPath.previous = bestPath
            newPath.total = bestPath.total + e.weight


            //add the new path to the frontier
            frontier.enQueue(newPath)

        }


        //preserve the bestPaths that match destination
        if (bestPath.destination.key == destination.key) {
            finalPaths.enQueue(bestPath)
        }


        //remove the bestPath from the frontier
        frontier.deQueue()


    } //end while



    //obtain the shortest path from the heap
    var shortestPath: Path! = Path()
    shortestPath = finalPaths.peek()


    return shortestPath

}
```

```
//MARK: traversal algorithms


//bfs traversal with inout closure function
func traverse(_ startingv: Vertex, formula: (_ node: inout Vertex) -> ()) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
    graphQueue.enQueue(startingv)


    while !graphQueue.isEmpty() {

        //traverse the next queued vertex
        var vitem: Vertex = graphQueue.deQueue() as Vertex!


        //add unvisited vertices to the queue
        for e in vitem.neighbors {
            if e.neighbor.visited == false {
                print("adding vertex: \(e.neighbor.key!) to queue..")
                graphQueue.enQueue(e.neighbor)
            }
        }


        /*
        notes: this demonstrates how to invoke a closure with an inout parameter.
        By passing by reference no return value is required.
        */

        //invoke formula
        formula(&vitem)


    } //end while


    print("graph traversal complete..")


}




//breadth first search
func traverse(_ startingv: Vertex) {


    //establish a new queue
    let graphQueue: Queue<Vertex> = Queue<Vertex>()


    //queue a starting vertex
```

```
        graphQueue.enQueue(startingv)


        while !graphQueue.isEmpty() {

            //traverse the next queued vertex
            let vitem = graphQueue.deQueue() as Vertex!

            guard vitem != nil else {
                return
            }

            //add unvisited vertices to the queue
            for e in vitem!.neighbors {
                if e.neighbor.visited == false {
                    print("adding vertex: \(e.neighbor.key!) to queue..")
                    graphQueue.enQueue(e.neighbor)
                }
            }


            vitem!.visited = true
            print("traversed vertex: \(vitem!.key!)..")


        } //end while


        print("graph traversal complete..")


    } //end function



    //use bfs with trailing closure to update all values
    func update(startingv: Vertex, formula:((Vertex) -> Bool)) {


        //establish a new queue
        let graphQueue: Queue<Vertex> = Queue<Vertex>()


        //queue a starting vertex
        graphQueue.enQueue(startingv)


        while !graphQueue.isEmpty() {

            //traverse the next queued vertex
            let vitem = graphQueue.deQueue() as Vertex!

            guard vitem != nil else {
                return
            }

            //add unvisited vertices to the queue
            for e in vitem!.neighbors {
                if e.neighbor.visited == false {
                    print("adding vertex: \(e.neighbor.key!) to queue..")
                    graphQueue.enQueue(e.neighbor)
```

```
                }
            }


            //apply formula..
            if formula(vitem!) == false {
                print("formula unable to update: \(vitem!.key)")
            }
            else {
                print("traversed vertex: \(vitem!.key!)..")
            }

            vitem!.visited = true


        } //end while


        print("graph traversal complete..")


    }




}
```

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“”/

。

“”。 。 。

Swift https://riptutorial.com/zh-TW/swift/topic/9116/swift

13: Typealias

Examples

```
typealias SuccessHandler = (NSURLSessionDataTask, AnyObject?) -> Void
```

```
SuccessHandlervar string = ""string。

SuccessHandler
```

```
typealias SuccessHandler = (NSURLSessionDataTask, AnyObject?) -> Void
```

```
typealias SuccessHandler = (NSURLSessionDataTask, AnyObject?) -> Void
```

```
typealias Handler = () -> Void
typealias Handler = () -> ()
```

Void to Void。

```
typealias Handler = () -> Void
typealias Handler = () -> ()
```

```
typealias Number = NSNumber
```

```
。

typealias Number = NSNumber
```

```
typealias Number = NSNumber
```

Typealias https://riptutorial.com/zh-TW/swift/topic/7552/typealias

14:

- Swift 3.0
- DispatchQueue.main //
- DispatchQueue“my-serial-queue”[。 serial.qosBackground]//
- DispatchQueue.globalattributes[。 qosDefault]//
- DispatchQueue.main.async {...} //
- DispatchQueue.main.sync {...} //
- DispatchQueue.main.asyncAfter.now+ 3{...} //x
- <3.0
- dispatch_get_main_queue//
- dispatch_get_global_queuedispatch_queue_priority_t0//dispatch_queue_priority_t
- dispatch_asyncdispatch_queue_t{ - > Void in ...} //dispatch_queue_t
- dispatch_syncdispatch_queue_t{ - > Void in ...} //dispatch_queue_t
- dispatch_afterdispatch_timeDISPATCH_TIME_NOWInt64dispatch_queue_t{...}; // dispatch_queue_t

Examples

Grand Central DispatchGCD

Grand Central Dispatch“”。 。

- **Serial Dispatch Queues** 。 。
- 。
- **Main Dispatch Queue**。

3.0

```
let mainQueue = DispatchQueue.main
```

3.0

```
let mainQueue = DispatchQueue.main
```

。 Swift 3`DispatchQueue`

3.0

```
let mainQueue = DispatchQueue.main
```

```
let mainQueue = DispatchQueue.main
```

3.0

```
let mainQueue = DispatchQueue.main
```

iOS 8.`userInteractive` `.userInitiated` `.default` `.utility`.`background`。 `DISPATCH_QUEUE_PRIORITY_`。

3.0

```
let mainQueue = DispatchQueue.main
```

3.0

```
let mainQueue = DispatchQueue.main
```

Swift 3.`workItem`。 `.never` `.inherit`。 `.never`。

Grand Central DispatchGCD

3.0

`sync` `asyncafter`。

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

```
let queue = DispatchQueue(label: "myQueueName")
```

```
queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

UI`DispatchQueue.main.async { ... }`

2.0

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

`NSEC_PER_SEC`

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
```

```
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

UI

```
let queue = DispatchQueue(label: "myQueueName")

queue.async {
    //do something

    DispatchQueue.main.async {
        //this will be called in main thread
        //any UI updates should be placed here
    }
}
// ... code here will execute immediately, before the task finished
```

UI`dispatch_async(dispatch_get_main_queue()) { ... }`

GCD。 。

```
for index in 0 ..< iterations {
    // Do something computationally expensive here
}
```

`concurrentPerform` Swift 3`dispatch_apply` Swift 2 `concurrentPerform`

3.0

```
for index in 0 ..< iterations {
    // Do something computationally expensive here
}
```

3.0

```
for index in 0 ..< iterations {
    // Do something computationally expensive here
}
```

`0iterationsindex。 。 。`

- `concurrentPerform` / `dispatch_apply`。 。
- 。 。
- 。 。

。“”。10010010,000。。

OperationQueue

OperationQueue。GCDFIFO。。

OperationQueue

3.0

```
let mainQueue = OperationQueue.main
```

OperationQueue

3.0

```
let mainQueue = OperationQueue.main
```

。

OperationOperationQueue

3.0

```
let mainQueue = OperationQueue.main
```

OperationQueue

3.0

```
let mainQueue = OperationQueue.main
```

OperationOperationQueue

3.0

```
let mainQueue = OperationQueue.main
```

Operation

```
let mainQueue = OperationQueue.main
```

。 isSuspendedfalse

3.0

```
let mainQueue = OperationQueue.main
```

OperationQueue。。

Foundation`Operation`。 。

`Operation`。 `isReady``true`。

`Operation`

3.0

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

2.3

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

`OperationQueue``OperationQueue`

1.0

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

。

`Operation`。

`Operation``Operation`。

1.0

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

Operation

1.0

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

◦ start◦

◦

OperationURLSessionOperation◦ isAsynchronoustrue startmain◦

OperationisExecuting isFinishedKVO◦ isExecutingtrue ◦ Operation isExecutingfalse isFinishedtrue ◦ isCancelledisFinishedtrue ◦ ◦

Operation ◦

cancelisCancelledtrue ◦ OperationmainisCancelled◦

1.0

```
class MyOperation: Operation {

    init(<parameters>) {
        // Do any setup work here
    }

    override func main() {
        // Perform the task
    }

}
```

https://riptutorial.com/zh-TW/swift/topic/1649/

15: Swift

。 。

Examples

```
struct Mathematics
{
    internal func performOperation(inputArray: [Int], operation: (Int)-> Int)-> [Int]
    {
        var processedArray = [Int]()

        for item in inputArray
        {
            processedArray.append(operation(item))
        }

        return processedArray
    }


    internal func performComplexOperation(valueOne: Int)-> ((Int)-> Int)
    {
        return
            ({
                 return valueOne + $0
            })
    }

}


let arrayToBeProcessed = [1,3,5,7,9,11,8,6,4,2,100]

let math = Mathematics()

func add2(item: Int)-> Int
{
    return (item + 2)
}

// assigning the function to a variable and then passing it to a function as param
let add2ToMe = add2
print(math.performOperation(inputArray: arrayToBeProcessed, operation: add2ToMe))
```

```
struct Mathematics
{
    internal func performOperation(inputArray: [Int], operation: (Int)-> Int)-> [Int]
    {
        var processedArray = [Int]()

        for item in inputArray
        {
            processedArray.append(operation(item))
        }
```

```
        return processedArray
    }


    internal func performComplexOperation(valueOne: Int)-> ((Int)-> Int)
    {
        return
            ({
                 return valueOne + $0
            })
    }

}


let arrayToBeProcessed = [1,3,5,7,9,11,8,6,4,2,100]

let math = Mathematics()

func add2(item: Int)-> Int
{
    return (item + 2)
}

// assigning the function to a variable and then passing it to a function as param
let add2ToMe = add2
print(math.performOperation(inputArray: arrayToBeProcessed, operation: add2ToMe))
```

closure

```
struct Mathematics
{
    internal func performOperation(inputArray: [Int], operation: (Int)-> Int)-> [Int]
    {
        var processedArray = [Int]()

        for item in inputArray
        {
            processedArray.append(operation(item))
        }

        return processedArray
    }


    internal func performComplexOperation(valueOne: Int)-> ((Int)-> Int)
    {
        return
            ({
                 return valueOne + $0
            })
    }

}


let arrayToBeProcessed = [1,3,5,7,9,11,8,6,4,2,100]

let math = Mathematics()
```

```
func add2(item: Int)-> Int
{
    return (item + 2)
}

// assigning the function to a variable and then passing it to a function as param
let add2ToMe = add2
print(math.performOperation(inputArray: arrayToBeProcessed, operation: add2ToMe))
```

```
func multiply2(item: Int)-> Int
{
    return (item + 2)
}


let multiply2ToMe = multiply2

// passing the function directly to the function as param
print(math.performOperation(inputArray: arrayToBeProcessed, operation: multiply2ToMe))
```

```
func multiply2(item: Int)-> Int
{
    return (item + 2)
}


let multiply2ToMe = multiply2

// passing the function directly to the function as param
print(math.performOperation(inputArray: arrayToBeProcessed, operation: multiply2ToMe))
```

closure

```
func multiply2(item: Int)-> Int
{
    return (item + 2)
}


let multiply2ToMe = multiply2

// passing the function directly to the function as param
print(math.performOperation(inputArray: arrayToBeProcessed, operation: multiply2ToMe))
```

```
// function as return type
print(math.performComplexOperation(valueOne: 4)(5))
```

9

Swift https://riptutorial.com/zh-TW/swift/topic/8618/swift

16: CObjective-C

AppleSwiftCocoaObjective-C。

Examples

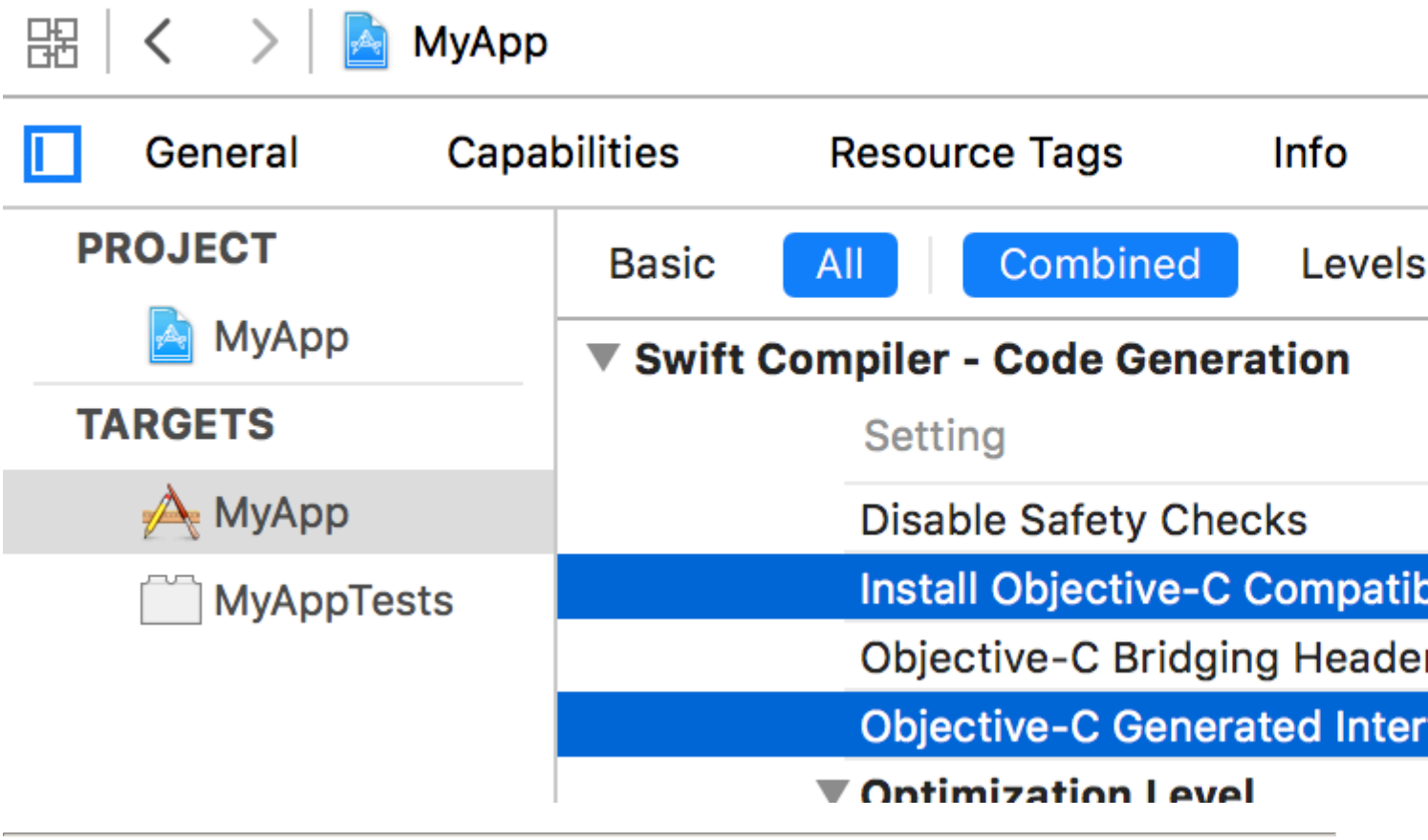
Objective-CSwift

“ **MyModule** ”Xcode`MyModule-Swift.h`SwiftObjective-C。 Swift

```
// MySwiftClass.swift in MyApp
import Foundation

// The class must be `public` to be visible, unless this target also has a bridging header
public class MySwiftClass: NSObject {
    // ...
}
```


```
// MySwiftClass.swift in MyApp
import Foundation

// The class must be `public` to be visible, unless this target also has a bridging header
public class MySwiftClass: NSObject {
    // ...
}
```


- **Objective-C** Obj-C。
- **Objective-C** -Swift.h。

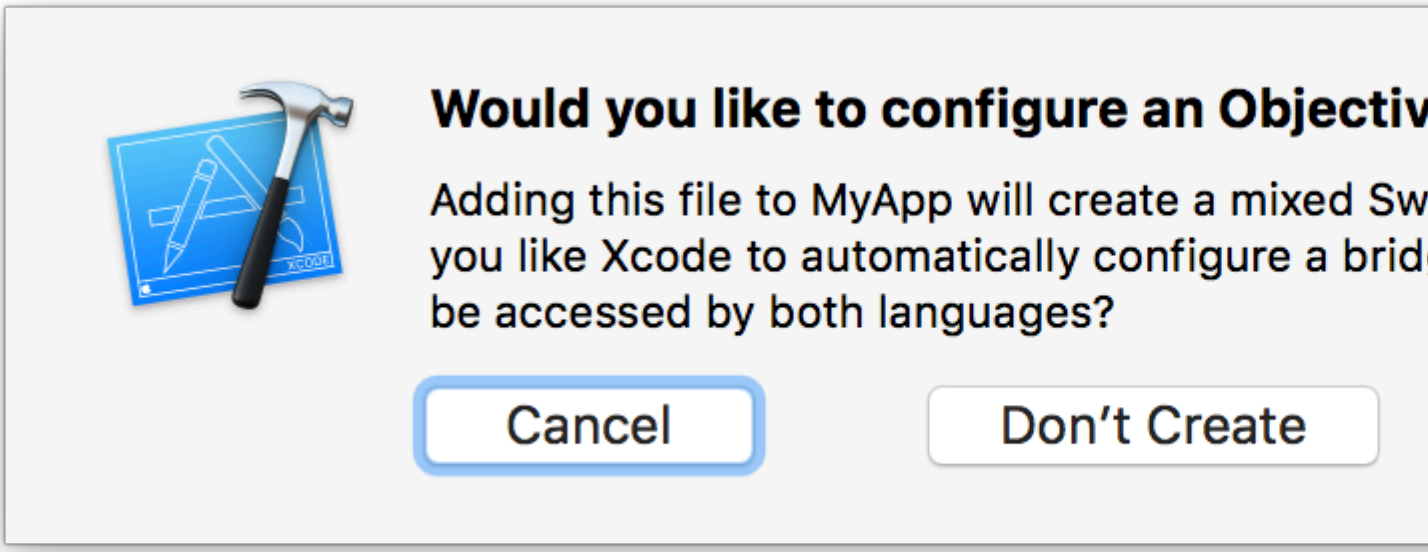


`@import MyFramework;`SwiftObj-C。

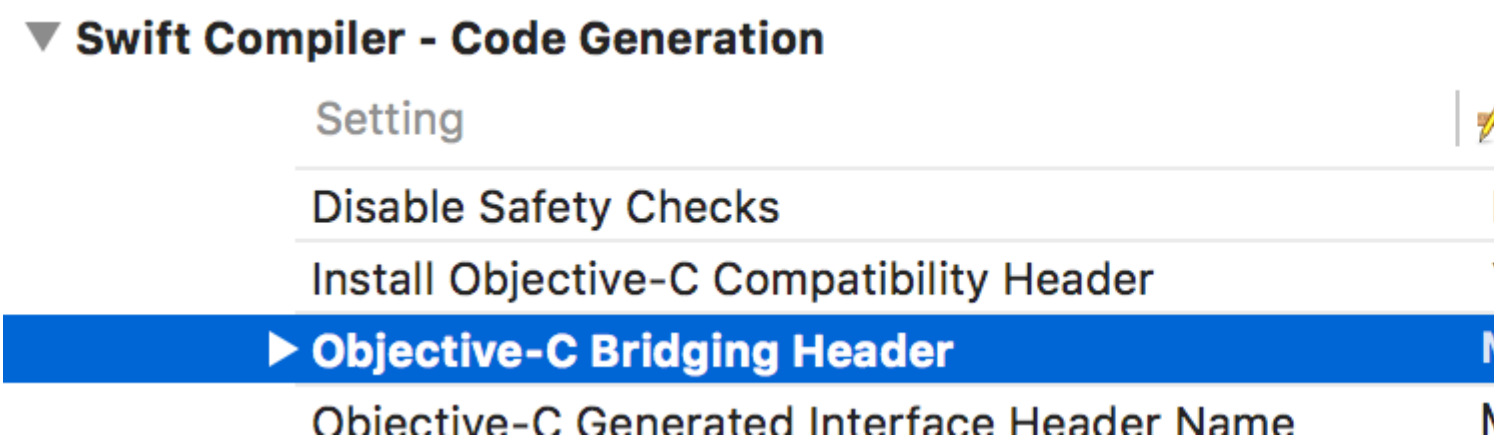
SwiftObjective-C

MyFrameworkObjective-C`import MyFramework`Swift。

SwiftObjective-CC。 Xcode

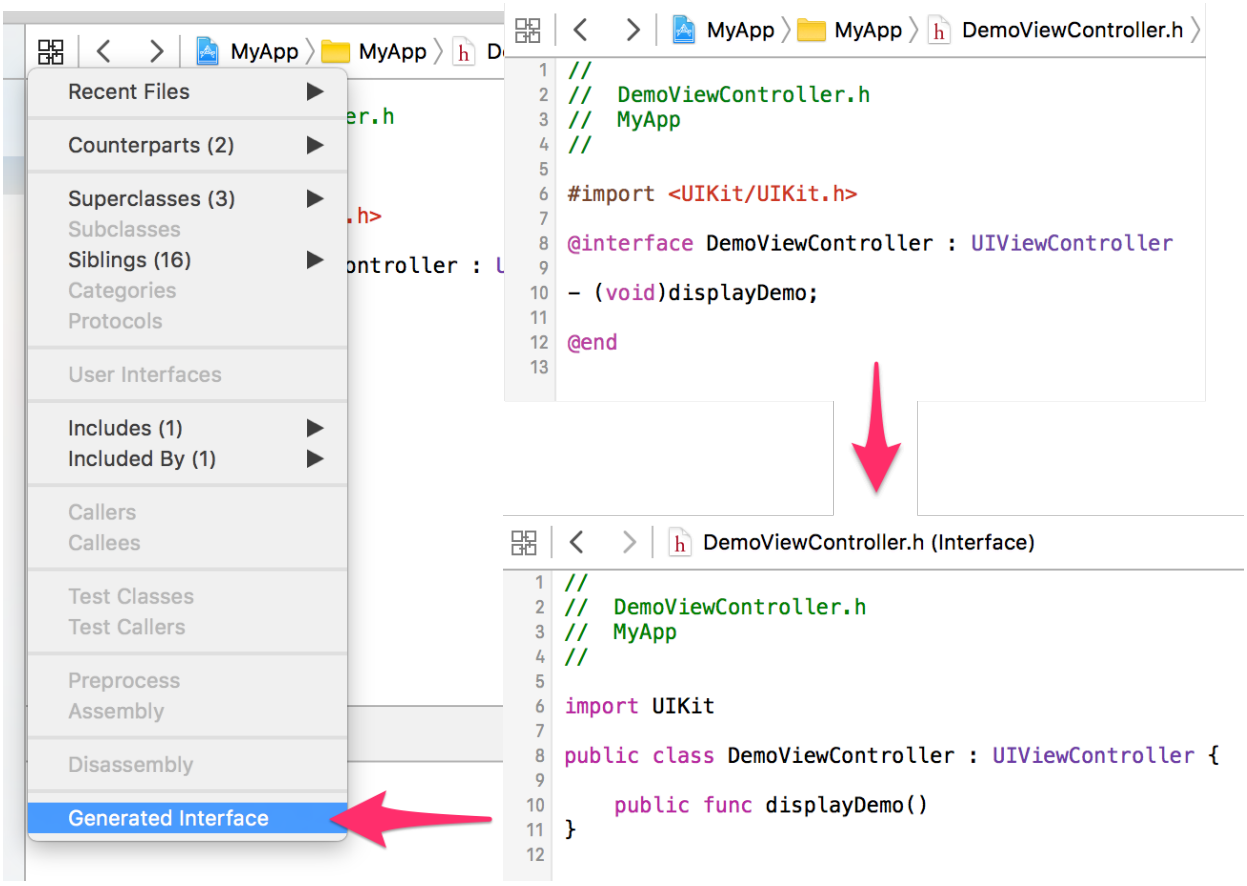


Objective-C Bridging Header




```
// MyApp-Bridging-Header.h
#import "MyClass.h"  // allows code in this module to use MyClass
```

Related Items^ 1**Generated Interface**Objective-CSwift。



swiftc

```
-import-objc-headerswiftc
```

```
// defs.h
struct Color {
    int red, green, blue;
};
```

```
#define MAX_VALUE 255
```

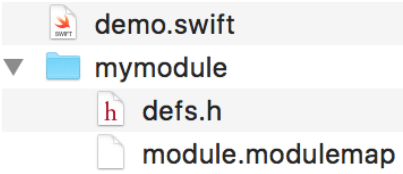
```
// defs.h
struct Color {
    int red, green, blue;
};

#define MAX_VALUE 255
```

```
// defs.h
struct Color {
    int red, green, blue;
};

#define MAX_VALUE 255
```

C

`import mymodule`CSwift。

`module.modulemapmymodule`




```
// mymodule/module.modulemap
module mymodule {
    header "defs.h"
}
```

`import`

```
// mymodule/module.modulemap
module mymodule {
    header "defs.h"
}
```

`-I directoryswiftc`

```
// mymodule/module.modulemap
module mymodule {
    header "defs.h"
}
```

Clang 。

Objective-CSwift

`NS_REFINED_FOR_SWIFT`APISwift __

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

“Swifty”**API** 。 NSNotFound

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

Objective-C`nil` 。 `_Nonnull`

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

Swift`nil`

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

`_Nonnull` `_Nullable` `nil`。 `_Nullable`;。

```
@interface MyClass : NSObject
- (NSInteger)indexOfObject:(id)obj NS_REFINED_FOR_SWIFT;
@end
```

。

C

SwiftCC。

LinuxC`Glibc`;Apple`Darwin` 。

```
#if os(macOS) || os(iOS) || os(tvOS) || os(watchOS)
import Darwin
#elseif os(Linux)
import Glibc
#endif

// use open(), read(), and other libc features
```

CObjective-C https://riptutorial.com/zh-TW/swift/topic/421/cobjective-c

17:

Examples

Dependenct

。 。 。

。 。 。

- 。

- UI
- -
-

DI

1.
2.
3. DISwinjectCleanseDipTyphoon

DIInversion of Control。

DIView Controllers - iOS。

DI

LoginViewControllerTimelineViewController 。 LoginViewControllerTimelineViewController。 **FirebaseNetworkService** 。

LoginViewController

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

TimelineViewController

```
class LoginViewController: UIViewController {
```

```
    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

FirebaseNetworkService

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

1015FirebaseNetworkService。 Firebase。 CompanyNetworkServiceFirebaseNetworkService。 CompanyNetworkService。

UI。

。

。 。

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

NetworkService

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

LoginViewControllerTimelineViewControllerNetworkServiceFirebaseNetworkService。

LoginViewController

```
class LoginViewController: UIViewController {
```

```
    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

TimelineViewController

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

LoginViewControllerTimelineViewControllerNetworkService

LoginViewController**AppDelegate**。

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

AppDelegateLoginViewControllerNetworkService。

TimelineViewControllerNetworkService。 LoginViewControllerTimlineViewController。

LoginViewControllerprepareForSegue。

LoginViewController

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

。

NetworkServiceFirebase。

NetworkService

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

AppDelegateFirebaseNetworkServiceImpl

```
class LoginViewController: UIViewController {

    var networkService = FirebaseNetworkService()

    override func viewDidLoad() {
        super.viewDidLoad()
    }
}
```

LoginViewControllerTimelineViewController。

DI。

Swift **DI**

1. Swift
2.
3.

DI

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
```

```
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
    var mainCar: TrainCar?
}
```

- Train

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
```

```
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
    var mainCar: TrainCar?
}
```

TrainEngine

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
```

```
    var mainCar: TrainCar?
}
```

let。 。

DI。 DIPassengerCar

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
    var mainCar: TrainCar?
}
```

。 mainCarPassengerCar。

◦ ◦ Train

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
    var mainCar: TrainCar?
}
```

Train`TrainCar` ◦

```
    protocol Engine {
        func startEngine()
        func stopEngine()
    }

    class TrainEngine: Engine {
        func startEngine() {
            print("Engine started")
```

```
        }

        func stopEngine() {
            print("Engine stopped")
        }
    }

    protocol TrainCar {
    var numberOfSeats: Int { get }
    func attachCar(attach: Bool)
}

class RestaurantCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 30
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class PassengerCar: TrainCar {
    var numberOfSeats: Int {
        get {
            return 50
        }
    }
    func attachCar(attach: Bool) {
        print("Attach car")
    }
}

class Train {
    let engine: Engine?
    var mainCar: TrainCar?
}
```

https://riptutorial.com/zh-TW/swift/topic/8198/

18:

。

。

:)。

-

。
developer.apple.com/library/content/documentation/Swift/Conceptual/Swift_Programming_Language/Thel

Examples

。 。

```
let tuple = ("one", 2, "three")

// Values are read using index numbers starting at zero
print(tuple.0) // one
print(tuple.1) // 2
print(tuple.2) // three
```


```
let tuple = ("one", 2, "three")

// Values are read using index numbers starting at zero
print(tuple.0) // one
print(tuple.1) // 2
print(tuple.2) // three
```

```
let tuple = ("one", 2, "three")

// Values are read using index numbers starting at zero
print(tuple.0) // one
print(tuple.1) // 2
print(tuple.2) // three
```


```
let myTuple = (name: "Some Name", age: 26)
let (first, second) = myTuple

print(first) // "Some Name"
print(second)  // 26
```


```
let myTuple = (name: "Some Name", age: 26)
let (first, second) = myTuple

print(first) // "Some Name"
print(second)  // 26
```

–

```
let myTuple = (name: "Some Name", age: 26)
let (first, second) = myTuple

print(first) // "Some Name"
print(second)  // 26
```

```
func tupleReturner() -> (Int, String) {
    return (3, "Hello")
}

let myTuple = tupleReturner()
print(myTuple.0) // 3
print(myTuple.1) // "Hello"
```

```
func tupleReturner() -> (Int, String) {
    return (3, "Hello")
}

let myTuple = tupleReturner()
print(myTuple.0) // 3
print(myTuple.1) // "Hello"
```

typealias

。

```
// Define a circle tuple by its center point and radius
let unitCircle: (center: (x: CGFloat, y: CGFloat), radius: CGFloat) = ((0.0, 0.0), 1.0)

func doubleRadius(ofCircle circle: (center: (x: CGFloat, y: CGFloat), radius: CGFloat)) ->
(center: (x: CGFloat, y: CGFloat), radius: CGFloat) {
    return (circle.center, circle.radius * 2.0)
}
```

`typealias`。


```
// Define a circle tuple by its center point and radius
let unitCircle: (center: (x: CGFloat, y: CGFloat), radius: CGFloat) = ((0.0, 0.0), 1.0)

func doubleRadius(ofCircle circle: (center: (x: CGFloat, y: CGFloat), radius: CGFloat)) ->
(center: (x: CGFloat, y: CGFloat), radius: CGFloat) {
    return (circle.center, circle.radius * 2.0)
}
```


`struct` 。

2。

2

2

```
var a = "Marty McFly"
var b = "Emmett Brown"
```

```
var a = "Marty McFly"
var b = "Emmett Brown"
```

```
var a = "Marty McFly"
var b = "Emmett Brown"
```

4

```
var a = "Marty McFly"
var b = "Emmett Brown"
```

Switch

```
let switchTuple = (firstCase: true, secondCase: false)

switch switchTuple {
 case (true, false):
    // do something
 case (true, true):
    // do something
 case (false, true):
    // do something
 case (false, false):
    // do something
}
```

EnumSize Classes

```
let switchTuple = (firstCase: true, secondCase: false)

switch switchTuple {
 case (true, false):
    // do something
 case (true, true):
    // do something
 case (false, true):
    // do something
 case (false, false):
    // do something
}
```

https://riptutorial.com/zh-TW/swift/topic/574/

19:

Swift。 。 。 [`Unmanaged`] [1]。 [1]https//developer.apple.com/reference/swift/unmanaged

weak-keyword

`weak`。

unowned-keyword

`unowned` -keyword。

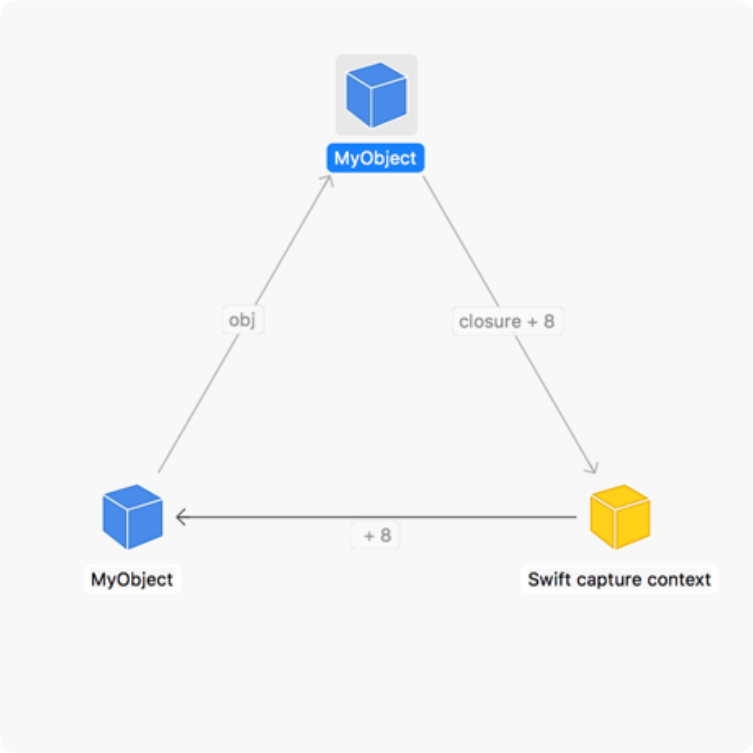
。

```
class A : CLLocationManagerDelegate
{
    init()
    {
        let locationManager = CLLocationManager()
        locationManager.delegate = self
        locationManager.startLocationUpdates()
    }
}
```

。

```
class A : CLLocationManagerDelegate
{
    init()
    {
        let locationManager = CLLocationManager()
        locationManager.delegate = self
        locationManager.startLocationUpdates()
    }
}
```

Examples



。 。

```
class A { var b: B? = nil }
class B { var a: A? = nil }

let a = A()
let b = B()

a.b = b  // a retains b
b.a = a  // b retains a -- a reference cycle
```

。 。

---

weakunowned 。

```
class A { var b: B? = nil }
class B { var a: A? = nil }

let a = A()
let b = B()

a.b = b  // a retains b
b.a = a  // b retains a -- a reference cycle
```

。 。 **nil** 。

```
class A { var b: B? = nil }
class B { var a: A? = nil }

let a = A()
let b = B()
```

```
a.b = b  // a retains b
b.a = a  // b retains a -- a reference cycle
```

`weakunowned` 。

C APISwift。 。

punnedC`toOpaqueUnmanagedfromOpaque`

```
setupDisplayLink() {
  let pointerToSelf: UnsafeRawPointer = Unmanaged.passUnretained(self).toOpaque()
  CVDisplayLinkSetOutputCallback(self.displayLink, self.redraw, pointerToSelf)
}

func redraw(pointerToSelf: UnsafeRawPointer, /* args omitted */) {
  let recoveredSelf = Unmanaged<Self>.fromOpaque(pointerToSelf).takeUnretainedValue()
  recoveredSelf.doRedraw()
}
```

`passUnretainedunowned`。

Objective-C API。 `Unmanagedretainrelease` 。 `passRetainedtakeRetainedValue`

```
setupDisplayLink() {
  let pointerToSelf: UnsafeRawPointer = Unmanaged.passUnretained(self).toOpaque()
  CVDisplayLinkSetOutputCallback(self.displayLink, self.redraw, pointerToSelf)
}

func redraw(pointerToSelf: UnsafeRawPointer, /* args omitted */) {
  let recoveredSelf = Unmanaged<Self>.fromOpaque(pointerToSelf).takeUnretainedValue()
  recoveredSelf.doRedraw()
}
```

API。

https://riptutorial.com/zh-TW/swift/topic/745/

20:

Examples

```
struct Example {
    var upvotes: Int
    init() {
        upvotes = 42
    }
}
let myExample = Example() // call the initializer
print(myExample.upvotes) // prints: 42
```

```
struct Example {
    var upvotes: Int
    init() {
        upvotes = 42
    }
}
let myExample = Example() // call the initializer
print(myExample.upvotes) // prints: 42
```

- downvotes

```
struct Example {
    var upvotes: Int
    init() {
        upvotes = 42
    }
}
let myExample = Example() // call the initializer
print(myExample.upvotes) // prints: 42
```

```
struct MetricDistance {
    var distanceInMeters: Double

    init(fromCentimeters centimeters: Double) {
        distanceInMeters = centimeters / 100
    }
    init(fromKilometers kilos: Double) {
        distanceInMeters = kilos * 1000
    }
}

let myDistance = MetricDistance(fromCentimeters: 42)
// myDistance.distanceInMeters is 0.42
let myOtherDistance = MetricDistance(fromKilometers: 42)
// myOtherDistance.distanceInMeters is 42000
```

```
struct MetricDistance {
    var distanceInMeters: Double

    init(fromCentimeters centimeters: Double) {
```

```
        distanceInMeters = centimeters / 100
    }
    init(fromKilometers kilos: Double) {
        distanceInMeters = kilos * 1000
    }
}

let myDistance = MetricDistance(fromCentimeters: 42)
// myDistance.distanceInMeters is 0.42
let myOtherDistance = MetricDistance(fromKilometers: 42)
// myOtherDistance.distanceInMeters is 42000
```

_

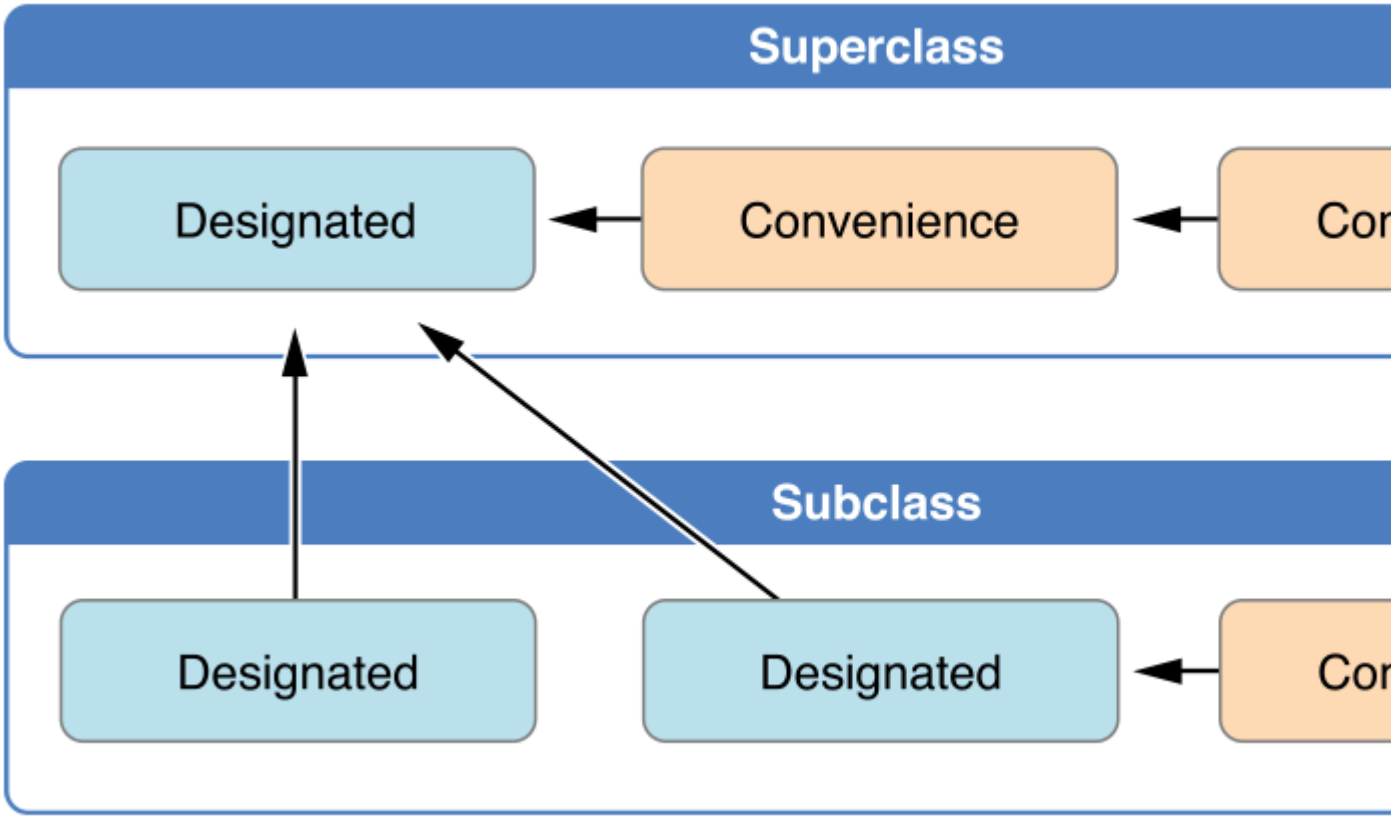
```
struct MetricDistance {
    var distanceInMeters: Double

    init(fromCentimeters centimeters: Double) {
        distanceInMeters = centimeters / 100
    }
    init(fromKilometers kilos: Double) {
        distanceInMeters = kilos * 1000
    }
}

let myDistance = MetricDistance(fromCentimeters: 42)
// myDistance.distanceInMeters is 0.42
let myOtherDistance = MetricDistance(fromKilometers: 42)
// myOtherDistance.distanceInMeters is 42000
```

`self`

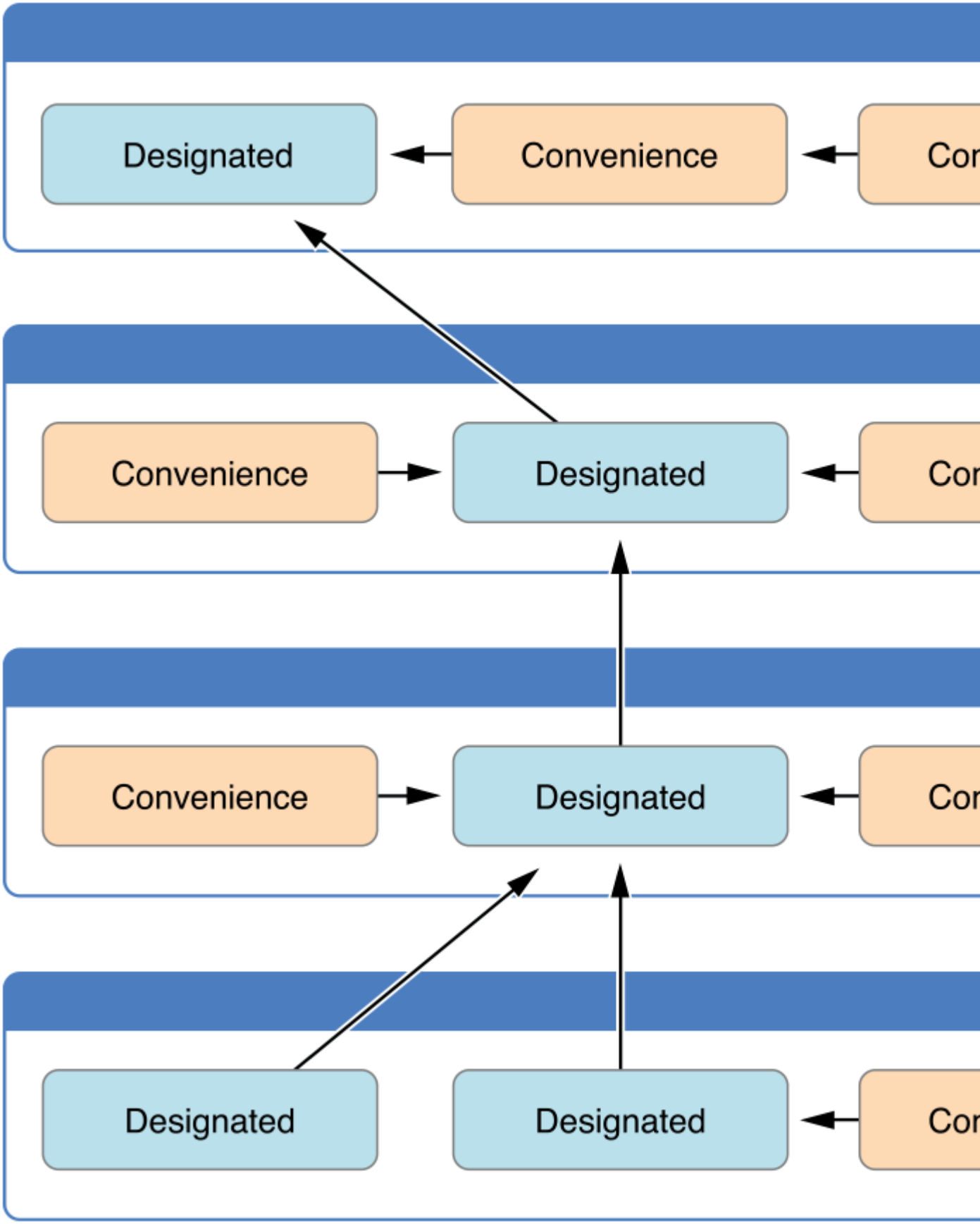
```
struct MetricDistance {
    var distanceInMeters: Double

    init(fromCentimeters centimeters: Double) {
        distanceInMeters = centimeters / 100
    }
    init(fromKilometers kilos: Double) {
        distanceInMeters = kilos * 1000
    }
}

let myDistance = MetricDistance(fromCentimeters: 42)
// myDistance.distanceInMeters is 0.42
let myOtherDistance = MetricDistance(fromKilometers: 42)
// myOtherDistance.distanceInMeters is 42000
```

Swift。Apple3

1. 。


Superclass
Designated
Convenience
Subclass
Designated
Designated

2. ◦
3. ◦




```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool
```

```
    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
    }
}


class Baz: Foo
{
    var someFloat: Float

    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool

    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
```

```
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
    }
}


class Baz: Foo
{
    var someFloat: Float

    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

init

```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool

    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
```

```
    }
}


class Baz: Foo
{
    var someFloat: Float

    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

initotherStringString

```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool

    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
    }
}


class Baz: Foo
{
    var someFloat: Float
```

```
    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool

    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
    }
}


class Baz: Foo
{
    var someFloat: Float

    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
```

```
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

init

```
class Foo {

    var someString: String
    var someValue: Int
    var someBool: Bool

    // Designated Initializer
    init(someString: String, someValue: Int, someBool: Bool)
    {
        self.someString = someString
        self.someValue = someValue
        self.someBool = someBool
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(otherString: "")
    }

    // A convenience initializer must ultimately call a designated initializer.
convenience init(otherString: String)
    {
        self.init(someString: otherString, someValue:  0, someBool: false)
    }
}


class Baz: Foo
{
    var someFloat: Float

    // Designed initializer
    init(someFloat: Float)
    {
        self.someFloat = someFloat

        // A designated initializer must call a designated initializer from its immediate
superclass.
        super.init(someString: "", someValue: 0, someBool: false)
    }

    // A convenience initializer must call another initializer from the same class.
    convenience init()
    {
        self.init(someFloat: 0)
    }
}
```

Swift

Struct

```
enum ValidationError: Error {
    case invalid
}
```

Struct

```
enum ValidationError: Error {
    case invalid
}
```

throwable

```
enum ValidationError: Error {
    case invalid
}
```

https://riptutorial.com/zh-TW/swift/topic/1778/

21:

Examples

◦ hello ◦

```
func hello()
{
    print("Hello World")
}
```

◦

```
func hello()
{
    print("Hello World")
}
```

◦ ◦

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

`\(number1)` String Interpolation String◦

◦

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

Int◦

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

◦

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

。

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

。

```
func magicNumber(number1: Int)
{
    print("\(number1) Is the magic number")
}
```

。

```
func findHypotenuse(a: Double, b: Double) -> Double
{
    return sqrt((a * a) + (b * b))
}

let c = findHypotenuse(3, b: 5)
//c = 5.830951894845301
```

。

```
func findHypotenuse(a: Double, b: Double) -> Double
{
    return sqrt((a * a) + (b * b))
}

let c = findHypotenuse(3, b: 5)
//c = 5.830951894845301
```

throws

```
func errorThrower()throws -> String {}
```

throw

```
func errorThrower()throws -> String {}
```

dotry

```
func errorThrower()throws -> String {}
```

Swift

Swift 。 。

func。

```
class Counter {
    var count = 0
    func increment() {
        count += 1
    }
}
```

Counterincrement()

```
class Counter {
    var count = 0
    func increment() {
        count += 1
    }
}
```

static func。 class func。

```
class Counter {
    var count = 0
    func increment() {
        count += 1
    }
}
```

```
class Counter {
    var count = 0
    func increment() {
        count += 1
    }
}
```

Inout

inout。 inout& 。

```
func updateFruit(fruit: inout Int) {
    fruit -= 1
}

var apples = 30 // Prints "There's 30 apples"
print("There's \(apples) apples")

updateFruit(fruit: &apples)

print("There's now \(apples) apples") // Prints "There's 29 apples".
```

。

```
func loadData(id: String, completion:(result: String) -> ()) {
    // ...
    completion(result:"This is the result data")
}
```

Trailing Closure

```
func loadData(id: String, completion:(result: String) -> ()) {
    // ...
    completion(result:"This is the result data")
}
```

`+ - ??`。

- **-** x
- x **+** y
- x **++**

Swift。

。 `sum`

```
func sum(_ a: Int, _ b: Int) -> Int {
    return a + b
}
```

```
func sum(_ a: Int, _ b: Int) -> Int {
    return a + b
}
```

。 Swift `...`

```
func sum(_ a: Int, _ b: Int) -> Int {
    return a + b
}
```

`numbers[Int]Array`。 `T...[T]`。

```
func sum(_ a: Int, _ b: Int) -> Int {
    return a + b
}
```

Swift。

。 `sum`。 variadic。 `sum`

```
func sum(_ a: Int, _ b: Int) -> Int {
    return a + b
}
```

。

```
struct DaysOfWeek {

  var days = ["Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"]
```

```
  subscript(index: Int) -> String {
    get {
      return days[index]
    }
    set {
      days[index] = newValue
    }
  }
}
```

```
struct DaysOfWeek {

  var days = ["Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"]

  subscript(index: Int) -> String {
    get {
      return days[index]
    }
    set {
      days[index] = newValue
    }
  }
}
```

◦ ◦ ◦

```
struct DaysOfWeek {

  var days = ["Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"]

  subscript(index: Int) -> String {
    get {
      return days[index]
    }
    set {
      days[index] = newValue
    }
  }
}
```

```
struct DaysOfWeek {

  var days = ["Sun", "Mon", "Tue", "Wed", "Thu", "Fri", "Sat"]

  subscript(index: Int) -> String {
    get {
      return days[index]
    }
    set {
      days[index] = newValue
    }
  }
}
```

◦ Void ◦

```
func closedFunc(block: (()->Void)? = nil) {
    print("Just beginning")

    if let block = block {
        block()
    }
}
```


```
func closedFunc(block: (()->Void)? = nil) {
    print("Just beginning")

    if let block = block {
        block()
    }
}
```


print closedFunc()。

```
func closedFunc(block: (()->Void)? = nil) {
    print("Just beginning")

    if let block = block {
        block()
    }
}
```


1

2

```
func jediTrainer () -> ((String, Int) -> String) {
  func train(name: String, times: Int) -> (String) {
    return "\(name) has been trained in the Force \(times) times"
  }
  return train
}

let train = jediTrainer()
train("Obi Wan", 3)
```

。

```
func sum(x: Int, y: Int) -> (result: Int) { return x + y }
```


```
func sum(x: Int, y: Int) -> (result: Int) { return x + y }
```


。

https://riptutorial.com/zh-TW/swift/topic/432/

22:

。 。

Swift。 。

。 gettersetter。

Swift 。

Objective-CSwift。

Java。

Examples

Swift。 “”。

Swift。

Swift/。 SwiftExtensions。 Protocol Extensions。

。 Protocol ExtensionsProtocolsSwift。

Swift。 Swift。 。 OOP。

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
    func doSomething() -> Bool              // instance method
    var message: String { get }             // instance read-only property
    var value: Int { get set }              // read-write instance property
    subscript(index: Int) -> Int { get }    // instance subscript
    static func instructions() -> String    // static method
    static var max: Int { get }             // static read-only property
    static var total: Int { get set }       // read-write static property
}
```

`{ get }``{ get set }`。 `{ get }`gettable。 `{ get set }`gettable。

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
    func doSomething() -> Bool              // instance method
    var message: String { get }             // instance read-only property
    var value: Int { get set }              // read-write instance property
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}
```

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    subscript(index: Int) -> Int { get }    // instance subscript
    static func instructions() -> String    // static method
    static var max: Int { get }             // static read-only property
    static var total: Int { get set }       // read-write static property
}
```

associatedtype

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
    func doSomething() -> Bool              // instance method
    var message: String { get }             // instance read-only property
    var value: Int { get set }              // read-write instance property
    subscript(index: Int) -> Int { get }    // instance subscript
    static func instructions() -> String    // static method
    static var max: Int { get }             // static read-only property
    static var total: Int { get set }       // read-write static property
}
```

3.0

Swift 3 &

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
    func doSomething() -> Bool              // instance method
    var message: String { get }             // instance read-only property
    var value: Int { get set }              // read-write instance property
    subscript(index: Int) -> Int { get }    // instance subscript
    static func instructions() -> String    // static method
    static var max: Int { get }             // static read-only property
    static var total: Int { get set }       // read-write static property
}
```

3.0

protocol<...> <>∘

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
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    static var max: Int { get }             // static read-only property
    static var total: Int { get set }       // read-write static property
}
```

```
protocol MyProtocol {
    init(value: Int)                        // required initializer
```

```
    func doSomething() -> Bool            // instance method
    var message: String { get }           // instance read-only property
    var value: Int { get set }            // read-write instance property
    subscript(index: Int) -> Int { get }  // instance subscript
    static func instructions() -> String  // static method
    static var max: Int { get }           // static read-only property
    static var total: Int { get set }     // read-write static property
}
```

associatedtype

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

associatedtypeassociatedtype

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

T - Element associatedtype Element。 Elementassociatedtype Element。

typealiasassociatedtype typealias

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

```
protocol Container {
    associatedtype Element
    var count: Int { get }
    subscript(index: Int) -> Element { get set }
}
```

CocoaCocoaTouch。 。

。 Objectsprotocol。 。

。

。

```
class Parent { }
class Child { }
```

。

Swiftprotocoldelegateprotocol 。 delegateparent。

```
class Parent { }
class Child { }
```

```
class Parent { }
class Child { }
```

delegateChildDelegate delegateweak。 delegate。 。

weakclassChildDelegate。

```
class Parent { }
class Child { }
```

。

ChildDelegate。

```
class Parent { }
class Child { }
```

```
class Parent { }
class Child { }
```

```
class Parent { }
class Child { }
```

Swift protocol。 @objcoptional。

UITableViewiOSUITableViewDelegateUITableViewDataSource。

```
class Parent { }
class Child { }
```

```
class Parent { }
class Child { }
```

optionalUITableViewDelegate。

。

```
protocol MyProtocol {
    func doSomething()
}

extension MyProtocol where Self: UIViewController {
    func doSomething() {
        print("UIViewController default protocol implementation")
    }
}

class MyViewController: UIViewController, MyProtocol { }

let vc = MyViewController()
vc.doSomething() // Prints "UIViewController default protocol implementation"
```

RawRepresentable

```
// RawRepresentable has an associatedType RawValue.
// For this struct, we will make the compiler infer the type
// by implementing the rawValue variable with a type of String
//
// Compiler infers RawValue = String without needing typealias
//
struct NotificationName: RawRepresentable {
    let rawValue: String

    static let dataFinished = NotificationNames(rawValue: "DataFinishedNotification")
}
```


```
// RawRepresentable has an associatedType RawValue.
// For this struct, we will make the compiler infer the type
// by implementing the rawValue variable with a type of String
//
// Compiler infers RawValue = String without needing typealias
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struct NotificationName: RawRepresentable {
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}
```


RawRepresentable

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```

```
//
struct NotificationName: RawRepresentable {
    let rawValue: String

    static let dataFinished = NotificationNames(rawValue: "DataFinishedNotification")
}
```

NotificationName

```
// RawRepresentable has an associatedType RawValue.
// For this struct, we will make the compiler infer the type
// by implementing the rawValue variable with a type of String
//
// Compiler infers RawValue = String without needing typealias
//
struct NotificationName: RawRepresentable {
    let rawValue: String

    static let dataFinished = NotificationNames(rawValue: "DataFinishedNotification")
}
```

RawRepresentable

```
// RawRepresentable has an associatedType RawValue.
// For this struct, we will make the compiler infer the type
// by implementing the rawValue variable with a type of String
//
// Compiler infers RawValue = String without needing typealias
//
struct NotificationName: RawRepresentable {
    let rawValue: String

    static let dataFinished = NotificationNames(rawValue: "DataFinishedNotification")
}
```

class◦ ◦

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

ClassOnlyProtocol ◦

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

ClassOnlyProtocol ◦

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

。

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

Foobarfoo。

Foo - var。

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

weakweak。

```
protocol ClassOnlyProtocol: class, SomeOtherProtocol {
    // Protocol requirements
}
```

Hashable

SetsDictionaries(key)HashableEquatable。

Hashable

- hashValue
- ==!= 。

structHashable

```
struct Cell {
    var row: Int
    var col: Int

    init(_ row: Int, _ col: Int) {
        self.row = row
        self.col = col
    }
}

extension Cell: Hashable {

    // Satisfy Hashable requirement
    var hashValue: Int {
        get {
            return row.hashValue^col.hashValue
        }
    }
```

```
    // Satisfy Equatable requirement
    static func ==(lhs: Cell, rhs: Cell) -> Bool {
        return lhs.col == rhs.col && lhs.row == rhs.row
    }

}

// Now we can make Cell as key of dictonary
var dict = [Cell : String]()

dict[Cell(0, 0)] = "0, 0"
dict[Cell(1, 0)] = "1, 0"
dict[Cell(0, 1)] = "0, 1"

// Also we can create Set of Cells
var set = Set<Cell>()

set.insert(Cell(0, 0))
set.insert(Cell(1, 0))
```

。 。

https://riptutorial.com/zh-TW/swift/topic/241/

23:

- //
- mirror.displayStyle //Xcode
- mirror.description //CustomStringConvertible
- mirror.subjectType //
- mirror.superclassMirror //

1.

`Mirror`Swift`struct` ◦ ◦ `Core Data`◦ `structNSManagedObject` ◦

2.

`Mirrorchildren`Mirror◦ `childlabelvalue` ◦ `titleGame of Thrones: A Song of Ice and FireGame of Thrones: A Song of Ice and Fire`◦

Examples

Mirror

```
class Project {
    var title: String = ""
    var id: Int = 0
    var platform: String = ""
    var version: Int = 0
    var info: String?
}
```

◦ Project◦

```
class Project {
    var title: String = ""
    var id: Int = 0
    var platform: String = ""
    var version: Int = 0
    var info: String?
}
```

Mirror◦ children`AnyForwardCollection<Child>` `Child`subjecttypealias◦ `Childlabel: Stringvalue: Any` ◦

```
class Project {
    var title: String = ""
    var id: Int = 0
    var platform: String = ""
    var version: Int = 0
    var info: String?
}
```

XcodePlaygroundConsolefor for。

```
class Project {
    var title: String = ""
    var id: Int = 0
    var platform: String = ""
    var version: Int = 0
    var info: String?
}
```

Xcode 8 beta 2Playground

`value.dynamicType` Swift 3 `type(of: value)` Swift 2 `value.dynamicType` Swift`Mirror` 。

`NSObject` `class_copyPropertyList` `property_getAttributes` - 。 Github

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}

   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

`primitiveDataTypes`Dictionary

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
```

```
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}

   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

`NSObject.TypeNSObjectNSDate` Swift3 `Date` `NSString` Swift3 `String` `NSNumber` `Any`Dictionary。 IntInt32 Bool `value types`。 NSObject `.self`Int- `Int.self.self`NSObject.Type`Any`。 `Dictionary<String, Any>?` `Dictionary<String, NSObject.Type>?` 。

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}

   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

`AnyNSObject.Type`

`NSObject`standard ==

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}

   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

==

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}
```

```
   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

value types

```
func getTypesOfProperties(in clazz: NSObject.Type) -> Dictionary<String, Any>? {
    var count = UInt32()
    guard let properties = class_copyPropertyList(clazz, &count) else { return nil }
    var types: Dictionary<String, Any> = [:]
    for i in 0..<Int(count) {
        guard let property: objc_property_t = properties[i], let name = getNameOf(property:
property) else { continue }
        let type = getTypeOf(property: property)
        types[name] = type
    }
    free(properties)
    return types
}

func getTypeOf(property: objc_property_t) -> Any {
    guard let attributesAsNSString: NSString = NSString(utf8String:
property_getAttributes(property)) else { return Any.self }
    let attributes = attributesAsNSString as String
    let slices = attributes.components(separatedBy: "\"")
    guard slices.count > 1 else { return getPrimitiveDataType(withAttributes: attributes) }
    let objectClassName = slices[1]
    let objectClass = NSClassFromString(objectClassName) as! NSObject.Type
    return objectClass
}

   func getPrimitiveDataType(withAttributes attributes: String) -> Any {
        guard let letter = attributes.substring(from: 1, to: 2), let type =
primitiveDataTypes[letter] else { return Any.self }
        return type
    }
```

value types。 NSObject var myOptionalInt: Int? class_copyPropertyList。

https://riptutorial.com/zh-TW/swift/topic/1201/

24:

Swift Documentarion

- @escaping。

Examples

Swift 12。 @noescape。

Swift 3。 @escaping。

```
class ClassOne {
  // @noescape is applied here as default
  func methodOne(completion: () -> Void) {
    //
  }
}

class ClassTwo {
  let obj = ClassOne()
  var greeting = "Hello, World!"

  func methodTwo() {
    obj.methodOne() {
      // self.greeting is required
      print(greeting)
    }
  }
}
```

Swift Documentarion

@escaping

- - self。 -

```
class ClassThree {

    var closure: (() -> ())?

    func doSomething(completion: @escaping () -> ()) {
        closure = finishBlock
    }
}
```

- @escaping。

https://riptutorial.com/zh-TW/swift/topic/8623/

25:

。

Examples

。 。

Dictionary

```
var books : Dictionary<Int, String> = Dictionary<Int, String>()
```

```
var books : Dictionary<Int, String> = Dictionary<Int, String>()
```

。 。

```
var books : Dictionary<Int, String> = Dictionary<Int, String>()
```

Dictionary

```
var books = [Int: String]()
//books = [:]
books[5] = "Book 5"
//books = [5: "Book 5"]
books.updateValue("Book 6", forKey: 5)
//[5: "Book 6"]
```

updateValue。

```
var books = [Int: String]()
//books = [:]
books[5] = "Book 5"
//books = [5: "Book 5"]
books.updateValue("Book 6", forKey: 5)
//[5: "Book 6"]
```

```
var books = [Int: String]()
//books = [:]
books[5] = "Book 5"
//books = [5: "Book 5"]
books.updateValue("Book 6", forKey: 5)
//[5: "Book 6"]
```

Dictionary

```
var books: [Int: String] = [1: "Book 1", 2: "Book 2"]
let bookName = books[1]
//bookName = "Book 1"
```

valuesvalues

```
var books: [Int: String] = [1: "Book 1", 2: "Book 2"]
let bookName = books[1]
//bookName = "Book 1"
```

keyskeys

```
var books: [Int: String] = [1: "Book 1", 2: "Book 2"]
let bookName = books[1]
//bookName = "Book 1"
```

keyvalue

```
var books: [Int: String] = [1: "Book 1", 2: "Book 2"]
let bookName = books[1]
//bookName = "Book 1"
```

Array Dictionary - 。

Dictionary。

```
var books: [Int: String] = [1: "Book 1", 2: "Book 2"]
let bookName = books[1]
//bookName = "Book 1"
```

Key

```
var dict = ["name": "John", "surname": "Doe"]
// Set the element with key: 'name' to 'Jane'
dict["name"] = "Jane"
print(dict)
```

```
let myAllKeys = ["name" : "Kirit" , "surname" : "Modi"]
let allKeys = Array(myAllKeys.keys)
print(allKeys)
```

```
extension Dictionary {
    func merge(dict: Dictionary<Key,Value>) -> Dictionary<Key,Value> {
        var mutableCopy = self
        for (key, value) in dict {
            // If both dictionaries have a value for same key, the value of the other
dictionary is used.
            mutableCopy[key] = value
        }
        return mutableCopy
    }
}
```

https://riptutorial.com/zh-TW/swift/topic/310/

26:

- String.characters //String
- String.characters.count //
- String.utf8 // String.UTF8ViewStringUTF-8
- String.utf16 // String.UTF16ViewStringUTF-16
- String.unicodeScalars // String.UnicodeScalarViewStringUTF-32
- String.isEmpty //Stringtrue
- String.hasPrefixString//Stringtrue
- String.hasSuffixString//Stringtrue
- String.startIndex //
- String.endIndex //
- String.componentsseparatedByString//
- String.appendCharacter//String

Swift`String`Unicode。 Swift StringsUnicodeUnicodeemojis。

String。

Swift 。

“Swift String Design”

Examples

Swift "

```
let greeting = "Hello!"  // greeting's type is String
```


```
let greeting = "Hello!"  // greeting's type is String
```

。 。

`\(value)` 。 。


```
let greeting = "Hello!"  // greeting's type is String
```


`"\(myobj)"String(myobj) print(myobj)。 CustomStringConvertible。`

3.0

Swift 3SE-0089 `String.init<T>(_:)String.init<T>(describing:)` 。

```
"\(myobj)"String.init<T: LosslessStringConvertible>(_:)LosslessStringConvertible
init<T>(describing:)
```

。

\0	
\\	\
\t	
\v	
\r	
\n	“”
\"	"
\'	'
\u{n}	Unicode*n*

```
let greeting = "Hello!"  // greeting's type is String
```

+

```
let name = "John"
let surname = "Appleseed"
let fullName = name + " " + surname  // fullName is "John Appleseed"
```

+=

```
let name = "John"
let surname = "Appleseed"
let fullName = name + " " + surname  // fullName is "John Appleseed"
```

```
let name = "John"
let surname = "Appleseed"
let fullName = name + " " + surname  // fullName is "John Appleseed"
```

```
let name = "John"
let surname = "Appleseed"
let fullName = name + " " + surname  // fullName is "John Appleseed"
```

3.0

appendContentsOf(_:)append(_:) 。

joinWithSeparator(_:)

```
let name = "John"
let surname = "Appleseed"
```

```
let fullName = name + " " + surname  // fullName is "John Appleseed"
```

3.0

`joinWithSeparator(_:)``joinWithSeparator(_:)` `joined(separator:)` 。

`separator["a", "b", "c"].joined() == "abc"` 。

```
if str.isEmpty {
    // do something if the string is empty
}

// If the string is empty, replace it with a fallback:
let result = str.isEmpty ? "fallback string" : str
```

Unicode

```
if str.isEmpty {
    // do something if the string is empty
}

// If the string is empty, replace it with a fallback:
let result = str.isEmpty ? "fallback string" : str
```

/

```
if str.isEmpty {
    // do something if the string is empty
}

// If the string is empty, replace it with a fallback:
let result = str.isEmpty ? "fallback string" : str
```

Swift StringUnicode。 。

```
let str = "ที่□①!"
```

`characters`Unicode

```
let str = "ที่□①!"
```

`unicodeScalars`Unicode ที่3--3607,3637,3656 - `characters`

```
let str = "ที่□①!"
```

UTF-8 `UInt8`UTF-16 `UInt16`

```
let str = "ที่□①!"
```

---

characters unicodeScalars utf8utf16Collection count

```
let str = "ที่□①!"
```

```
let str = "ที่□①!"
```

Unicode

```
var str: String = "I want to visit □□, Москва, मुंबई, القاهرة, and □□□. □"
var character: Character = "□"
```

```
var str: String = "I want to visit □□, Москва, मुंबई, القاهرة, and □□□. □"
var character: Character = "□"
```

Swift Characterunicode。 。

- >

```
var str: String = "I want to visit □□, Москва, मुंबई, القاهرة, and □□□. □"
var character: Character = "□"
```

- >

```
var str: String = "I want to visit □□, Москва, मुंबई, القاهرة, and □□□. □"
var character: Character = "□"
```

UTF-8UTF-16UTF-16。 。

2.2

```
let aString = "This is a test string."

// first, reverse the String's characters
let reversedCharacters = aString.characters.reverse()

// then convert back to a String with the String() initializer
let reversedString = String(reversedCharacters)

print(reversedString) // ".gnirts tset a si sihT"
```

3.0

```
let aString = "This is a test string."

// first, reverse the String's characters
let reversedCharacters = aString.characters.reverse()

// then convert back to a String with the String() initializer
```

```
let reversedString = String(reversedCharacters)

print(reversedString) // ".gnirts tset a si sihT"
```

2.2

```
let text = "AaBbCc"
let uppercase = text.uppercaseString // "AABBCC"
let lowercase = text.lowercaseString // "aabbcc"
```

3.0

```
let text = "AaBbCc"
let uppercase = text.uppercaseString // "AABBCC"
let lowercase = text.lowercaseString // "aabbcc"
```

String

3.0

```
let letters = CharacterSet.letters

let phrase = "Test case"
let range = phrase.rangeOfCharacter(from: letters)

// range will be nil if no letters is found
if let test = range {
   print("letters found")
}
else {
   print("letters not found")
}
```

2.2

```
let letters = CharacterSet.letters

let phrase = "Test case"
let range = phrase.rangeOfCharacter(from: letters)

// range will be nil if no letters is found
if let test = range {
   print("letters found")
}
else {
   print("letters not found")
}
```

Objective-C `NSCharacterSetCharacterSet`

- `decimalDigits`
- `capitalizedLetters`
- `alphanumerics`
- `controlCharacters`
- `illegalCharacters`
-

NSCharacterSet。

3.0

```
let letters = CharacterSet.letters

let phrase = "Test case"
let range = phrase.rangeOfCharacter(from: letters)

// range will be nil if no letters is found
if let test = range {
   print("letters found")
}
else {
   print("letters not found")
}
```

2.2

```
let letters = CharacterSet.letters

let phrase = "Test case"
let range = phrase.rangeOfCharacter(from: letters)

// range will be nil if no letters is found
if let test = range {
   print("letters found")
}
else {
   print("letters not found")
}
```

3.0

```
let letters = CharacterSet.letters

let phrase = "Test case"
let range = phrase.rangeOfCharacter(from: letters)

// range will be nil if no letters is found
if let test = range {
   print("letters found")
}
else {
   print("letters not found")
}
```

`StringCharacter`

```
let text = "Hello World"
let char: Character = "o"
```

`CharacterString`

```
let text = "Hello World"
let char: Character = "o"
```

Set

2.2

```
func removeCharactersNotInSetFromText(text: String, set: Set<Character>) -> String {
   return String(text.characters.filter { set.contains( $0) })
}

let text = "Swift 3.0 Come Out"
var chars =
Set([Character]("abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLKMNOPQRSTUVWXYZ".characters))
let newText = removeCharactersNotInSetFromText(text, set: chars) // "SwiftComeOut"
```

3.0

```
func removeCharactersNotInSetFromText(text: String, set: Set<Character>) -> String {
   return String(text.characters.filter { set.contains( $0) })
}

let text = "Swift 3.0 Come Out"
var chars =
Set([Character]("abcdefghijklmnopqrstuvwxyzABCDEFGHIJKLKMNOPQRSTUVWXYZ".characters))
let newText = removeCharactersNotInSetFromText(text, set: chars) // "SwiftComeOut"
```

```
let number: Int = 7
let str1 = String(format: "%03d", number) // 007
let str2 = String(format: "%05d", number) // 00007
```


```
let number: Int = 7
let str1 = String(format: "%03d", number) // 007
let str2 = String(format: "%05d", number) // 00007
```

```
let number: Int = 7
let str1 = String(format: "%03d", number) // 007
let str2 = String(format: "%05d", number) // 00007
```

```
let number: Int = 7
let str1 = String(format: "%03d", number) // 007
let str2 = String(format: "%05d", number) // 00007
```

```
let number: Int = 7
let str1 = String(format: "%03d", number) // 007
let str2 = String(format: "%05d", number) // 00007
```


Radix `[2, 36] Int ◦`

Swift

```
Int("123") // Returns 123 of Int type
Int("abcd") // Returns nil
Int("10") // Returns 10 of Int type
```

```
Int("10", radix: 2) // Returns 2 of Int type
Double("1.5") // Returns 1.5 of Double type
Double("abcd") // Returns nil
```

Optional 。

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

endIndexstring[string.endIndex]string[string.startIndex] 。 "" string.startIndex == string.endIndextrue 。 startIndex.successor() 。

3.0

Swift 3Stringsuccessor() predecessor() advancedBy(_:) advancedBy(_:limit:)distanceTo(_:) 。

。

.index(after:) ,. .index(before:).index(_:, offsetBy:) 。

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

currentIndex.index。

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
```

```
    print(string[index])
    index = index.successor()
}
```

`IndexInt` 。

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

3.0

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

```
let string = "My fantastic string"
var index = string.startIndex

while index != string.endIndex {
    print(string[index])
    index = index.successor()
}
```

WhiteSpaceNewLine

3.0

```
let someString = "  Swift Language  \n"
let trimmedString =
someString.stringByTrimmingCharactersInSet(NSCharacterSet.whitespaceAndNewlineCharacterSet())
// "Swift Language"
```

`stringByTrimmingCharactersInSet`String。

。

```
let someString = "  Swift Language  \n"
let trimmedString =
someString.stringByTrimmingCharactersInSet(NSCharacterSet.whitespaceAndNewlineCharacterSet())
// "Swift Language"
```

```
let someString = "  Swift Language  \n"
let trimmedString =
someString.stringByTrimmingCharactersInSet(NSCharacterSet.whitespaceAndNewlineCharacterSet())
// "Swift Language"
```

3.0

```
let someString = "  Swift Language  \n"
let trimmedString =
someString.stringByTrimmingCharactersInSet(NSCharacterSet.whitespaceAndNewlineCharacterSet())
```

```
// "Swift Language"
```

Foundation ◦ *CocoaUIKit* *import Foundationimport Foundation* ◦

Data / NSData

StringData / NSDataData / NSDataString◦ `UTF-8` Unicode8ASCII◦ `String Encodings`

`StringData` / `NSData`

3.0

```
let data = string.data(using: .utf8)
```

2.2

```
let data = string.data(using: .utf8)
```

`Data` / `NSData` to `String`

3.0

```
let data = string.data(using: .utf8)
```

2.2

```
let data = string.data(using: .utf8)
```

SwiftStringString

3.0

```
let startDate = "23:51"

let startDateAsArray = startDate.components(separatedBy: ":") // ["23", "51"]`
```

2.2

```
let startDate = "23:51"

let startDateAsArray = startDate.components(separatedBy: ":") // ["23", "51"]`
```

3.0

```
let startDate = "23:51"

let startDateAsArray = startDate.components(separatedBy: ":") // ["23", "51"]`
```

2.2

```
let startDate = "23:51"
```

```
let startDateAsArray = startDate.components(separatedBy: ":") // ["23", "51"]`
```

https://riptutorial.com/zh-TW/swift/topic/320/

27:

。

Examples

```
func sampleWithCompletion(completion:@escaping (()-> ())){
    let delayInSeconds = 1.0
    DispatchQueue.main.asyncAfter(deadline: DispatchTime.now() + delayInSeconds) {

        completion()

    }
}

//Call the function
sampleWithCompletion {
    print("after one second")
}
```

```
enum ReadResult{
    case Successful
    case Failed
    case Pending
}

struct OutpuData {
    var data = Data()
    var result: ReadResult
    var error: Error?
}

func readData(from url: String, completion: @escaping (OutpuData) ->  Void) {
    var _data = OutpuData(data: Data(), result: .Pending, error: nil)
    DispatchQueue.global().async {
        let url=URL(string: url)
        do {
            let rawData = try Data(contentsOf: url!)
            _data.result = .Successful
            _data.data = rawData
            completion(_data)
        }
        catch let error {
            _data.result = .Failed
            _data.error = error
            completion(_data)
        }

    }
}

readData(from: "https://raw.githubusercontent.com/trev/bearcal/master/sample-data-large.json")
{ (output) in
    switch output.result {
    case .Successful:
        break
```

```
    case .Failed:
        break
    case .Pending:
        break

    }
}
```

https://riptutorial.com/zh-TW/swift/topic/9378/

28:

Examples

MD2MD4MD5SHA1SHA224SHA256SHA384SHA512Swift 3

StringData。

nameString
MD2MD4MD5SHA1SHA224SHA256SHA384SHA512

Common Crypto

```
#import <CommonCrypto/CommonCrypto.h>
```

Security.framework。

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

String

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

```
name: A name of a hash function as a String
data: The Data to be hashed
returns: the hashed result as Data
```

HMACMD5SHA1SHA224SHA256SHA384SHA512Swift 3

StringData。

nameMD5SHA1SHA224SHA256SHA384SHA512

Common Crypto

```
#import <CommonCrypto/CommonCrypto.h>
```

Security.framework。

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

//

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

```
hashName: name of a hash function as String
message:  message as Data
key:      key as Data
returns:  digest as Data
```

https://riptutorial.com/zh-TW/swift/topic/7885/

29:

Examples

Bool

Bool `truefalse`。

```
let aTrueBool = true
let aFalseBool = false
```

Bools。 `if`

```
let aTrueBool = true
let aFalseBool = false
```

Bool

`!` operator。 `!truefalse` `!falsetrue`。

```
print(!true)  // prints "false"
print(!false) // prints "true"

func test(_ someBoolean: Bool) {
    if !someBoolean {
        print("someBoolean is false")
    }
}
```

trueOR||truefalse。 trueORtrue

```
if (10 < 20) || (20 < 10) {
    print("Expression is true")
}
```

trueAND&&true。 falsetrue

```
if (10 < 20) || (20 < 10) {
    print("Expression is true")
}
```

trueXOR^true。 truetrue

```
if (10 < 20) || (20 < 10) {
    print("Expression is true")
}
```

a bcSwift 。

3

```
question ? answerIfTrue : answerIfFalse
```

questionanswerIfTruefalseanswerIfFalse。

```
question ? answerIfTrue : answerIfFalse
```

```
question ? answerIfTrue : answerIfFalse
```

```
question ? answerIfTrue : answerIfFalse
```

https://riptutorial.com/zh-TW/swift/topic/735/

30:

Examples

defer。

guard。 defer。

。

```
func doSomething() {
    let data = UnsafeMutablePointer<UInt8>(allocatingCapacity: 42)
    // this pointer would not be released when the function returns
    // so we add a defer-statement
    defer {
        data.deallocateCapacity(42)
    }
    // it will be executed when the function returns.

    guard condition else {
        return /* will execute defer-block */
    }

}   // The defer-block will also be executed on the end of the function.
```


```
func doSomething() {
    let data = UnsafeMutablePointer<UInt8>(allocatingCapacity: 42)
    // this pointer would not be released when the function returns
    // so we add a defer-statement
    defer {
        data.deallocateCapacity(42)
    }
    // it will be executed when the function returns.

    guard condition else {
        return /* will execute defer-block */
    }

}   // The defer-block will also be executed on the end of the function.
```


defer。 defer。

```
postfix func ++ (inout value: Int) -> Int {
    defer { value += 1 } // do NOT do this!
    return value
}
```

https://riptutorial.com/zh-TW/swift/topic/4932/

31: StringUIImage

UIImage。 。

Examples

InitialsImageFactory

```
class InitialsImageFactory: NSObject {

class func imageWith(name: String?) -> UIImage? {

let frame = CGRect(x: 0, y: 0, width: 50, height: 50)
let nameLabel = UILabel(frame: frame)
nameLabel.textAlignment = .center
nameLabel.backgroundColor = .lightGray
nameLabel.textColor = .white
nameLabel.font = UIFont.boldSystemFont(ofSize: 20)
var initials = ""

if let initialsArray = name?.components(separatedBy: " ") {

  if let firstWord = initialsArray.first {
    if let firstLetter = firstWord.characters.first {
      initials += String(firstLetter).capitalized
    }

  }
  if initialsArray.count > 1, let lastWord = initialsArray.last {
    if let lastLetter = lastWord.characters.first {
      initials += String(lastLetter).capitalized
    }

  }
} else {
  return nil
}

nameLabel.text = initials
UIGraphicsBeginImageContext(frame.size)
if let currentContext = UIGraphicsGetCurrentContext() {
  nameLabel.layer.render(in: currentContext)
  let nameImage = UIGraphicsGetImageFromCurrentImageContext()
  return nameImage
}
return nil
}

}
```

StringUIImage https://riptutorial.com/zh-TW/swift/topic/10915/stringuiimage

32:

- {statements}
- for condition in condition where condition {statements}
- for var{statements}
- for _ in sequence {statements}
- for case{statements}
- for casecondition {statements}
- case var{statements}
- {}
- {statements}
- sequence.forEachbodyElementthrows - > Void

Examples

For-in

for-in。

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

2.1 2.2

`SequenceTypeenumerate()`。

```
for i in 0..<3 {
```

```
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

`enumerate()` `Int` 0。 - 。

3.0

Swift 3 `enumerate()` `enumerated()`

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

2.1 2.2

`SequenceType` `reverse()`

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}
```

```
// Both print:
// 0
// 1
// 2
```

3.0

Swift 3 `reverse()` `reversed()`

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

2.1 2.2

`Strideablestride(_:_:)`

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

1.2 3.0

Swift 3 `Stridablestride(_:_:)` `stride(_:_:_:)`

```
for i in 0..<3 {
    print(i)
}

for i in 0...2 {
    print(i)
}

// Both print:
// 0
// 1
// 2
```

while。 。

```
var i: Int = 0

repeat {
   print(i)
   i += 1
} while i < 3

// 0
// 1
// 2
```

while。

```
var count = 1

while count < 10 {
    print("This is the \(count) run of the loop")
    count += 1
}
```

SequenceType

```
collection.forEach { print($0) }
```

```
collection.forEach { print($0) }
```

*。 returncontinue。 。

```
collection.forEach { print($0) }
```

For-in

1. **where**

where。

```
for i in 0..<5 where i % 2 == 0 {
    print(i)
}

// 0
// 2
// 4


let names = ["James", "Emily", "Miles"]

for name in names where name.characters.contains("s") {
    print(name)
}
```

```
// James
// Miles
```

2. **case**

```
for i in 0..<5 where i % 2 == 0 {
    print(i)
}

// 0
// 2
// 4


let names = ["James", "Emily", "Miles"]

for name in names where name.characters.contains("s") {
    print(name)
}

// James
// Miles
```

?

```
for i in 0..<5 where i % 2 == 0 {
    print(i)
}

// 0
// 2
// 4


let names = ["James", "Emily", "Miles"]

for name in names where name.characters.contains("s") {
    print(name)
}

// James
// Miles
```

break◦

```
var peopleArray = ["John", "Nicole", "Thomas", "Richard", "Brian", "Novak", "Vick", "Amanda",
"Sonya"]
var positionOfNovak = 0

for person in peopleArray {
    if person == "Novak" { break }
    positionOfNovak += 1
}

print("Novak is the element located on position [\(positionOfNovak)] in peopleArray.")
//prints out: Novak is the element located on position 5 in peopleArray. (which is true)
```

https://riptutorial.com/zh-TW/swift/topic/1186/

33:

Examples

Swift。 Swift。 。 。 。

。 。

```
class MyClass {

    let myProperty: String

}
```

Swift。 。 。 。

```
class MyClass {

    let myProperty: String

}
```

。 /。

```
class MyClass {

    let myProperty: String

}
```

。 struct。

。

https://riptutorial.com/zh-TW/swift/topic/4067/

34:

Swift。

Examples

/get。

```
extension ExtensionOf {
    //new functions and get-variables
}
```

self

String.length()

```
extension ExtensionOf {
    //new functions and get-variables
}
```

get。 .length

```
extension ExtensionOf {
    //new functions and get-variables
}
```

。 IntNSString

```
extension Int {
    init?(_ string: NSString) {
        self.init(string as String)  // delegate to the existing Int.init(String) initializer
    }
}

let str1: NSString = "42"
Int(str1) // 42

let str2: NSString = "abc"
Int(str2) // nil
```

Swift。 。 。

Int 。

```
extension Int {
    var factorial: Int {
        return (1..<self+1).reduce(1, combine: *)
    }
}
```

Int API。

```
extension Int {
    var factorial: Int {
        return (1..<self+1).reduce(1, combine: *)
    }
}
```

Swift 2.2。

。

```
protocol FooProtocol {
    func doSomething()
}

extension FooProtocol {
    func doSomething() {
        print("Hi")
    }
}

class Foo: FooProtocol {
    func myMethod() {
        doSomething() // By just implementing the protocol this method is available
    }
}
```

。

where。

```
extension Array where Element: StringLiteralConvertible {
  func toUpperCase() -> [String] {
      var result = [String]()
      for value in self {
          result.append(String(value).uppercaseString)
      }
      return result
    }
}
```

```
extension Array where Element: StringLiteralConvertible {
  func toUpperCase() -> [String] {
      var result = [String]()
      for value in self {
          result.append(String(value).uppercaseString)
      }
      return result
    }
}
```

。 。

Swift

-
-
-
-
-
-

Swift Extensions

- Swift
- UIKit / Foundation
-
- //

-

```
extension Bool {
    public mutating func toggle() -> Bool {
        self = !self
        return self
    }
}

var myBool: Bool = true
print(myBool.toggle()) // false
```

。

String

2.2

```
extension String {
    subscript(index: Int) -> Character {
        let newIndex = startIndex.advancedBy(index)
        return self[newIndex]
    }
}

var myString = "StackOverFlow"
print(myString[2]) // a
print(myString[3]) // c
```

3.0

```
extension String {
    subscript(index: Int) -> Character {
        let newIndex = startIndex.advancedBy(index)
        return self[newIndex]
    }
}

var myString = "StackOverFlow"
print(myString[2]) // a
```

```
print(myString[3]) // c
```

https://riptutorial.com/zh-TW/swift/topic/324/

35:

Examples

Swift

- Intunsigned UInt 。
- Int8 Int16 Int32 Int64UInt8 UInt16 UInt32 UInt64 。
- Float32 / Float Float64 / DoubleFloat80 x86。

```
let x = 42    // x is Int by default
let y = 42.0  // y is Double by default

let z: UInt = 42     // z is UInt
let w: Float = -1    // w is Float
let q = 100 as Int8  // q is Int8
```

_ 。 。

«significand» **e** *«exponent»*; **0x** *«significand»* **p** *«exponent»*。


```
let x = 42    // x is Int by default
let y = 42.0  // y is Double by default

let z: UInt = 42     // z is UInt
let w: Float = -1    // w is Float
let q = 100 as Int8  // q is Int8
```

```
let x = 42    // x is Int by default
let y = 42.0  // y is Double by default

let z: UInt = 42     // z is UInt
let w: Float = -1    // w is Float
let q = 100 as Int8  // q is Int8
```


```
func doSomething1(value: Double) { /* ... */ }
func doSomething2(value: UInt) { /* ... */ }

let x = 42                // x is an Int
doSomething1(Double(x))   // convert x to a Double
doSomething2(UInt(x))     // convert x to a UInt
```


```
func doSomething1(value: Double) { /* ... */ }
func doSomething2(value: UInt) { /* ... */ }

let x = 42                // x is an Int
doSomething1(Double(x))   // convert x to a Double
doSomething2(UInt(x))     // convert x to a UInt
```

```
func doSomething1(value: Double) { /* ... */ }
func doSomething2(value: UInt) { /* ... */ }

let x = 42                // x is an Int
doSomething1(Double(x))  // convert x to a Double
doSomething2(UInt(x))    // convert x to a UInt
```


```
func doSomething1(value: Double) { /* ... */ }
func doSomething2(value: UInt) { /* ... */ }

let x = 42                // x is an Int
doSomething1(Double(x))  // convert x to a Double
doSomething2(UInt(x))    // convert x to a UInt
```


String

```
String(1635999)                              // returns "1635999"
String(1635999, radix: 10)                   // returns "1635999"
String(1635999, radix: 2)                    // returns "110001111011010011111"
String(1635999, radix: 16)                   // returns "18f69f"
String(1635999, radix: 16, uppercase: true)  // returns "18F69F"
String(1635999, radix: 17)                   // returns "129gf4"
String(1635999, radix: 36)                   // returns "z2cf"
```


```
String(1635999)                              // returns "1635999"
String(1635999, radix: 10)                   // returns "1635999"
String(1635999, radix: 2)                    // returns "110001111011010011111"
String(1635999, radix: 16)                   // returns "18f69f"
String(1635999, radix: 16, uppercase: true)  // returns "18F69F"
String(1635999, radix: 17)                   // returns "129gf4"
String(1635999, radix: 36)                   // returns "z2cf"
```



```
String(1635999)                              // returns "1635999"
String(1635999, radix: 10)                   // returns "1635999"
String(1635999, radix: 2)                    // returns "110001111011010011111"
String(1635999, radix: 16)                   // returns "18f69f"
String(1635999, radix: 16, uppercase: true)  // returns "18F69F"
String(1635999, radix: 17)                   // returns "129gf4"
String(1635999, radix: 36)                   // returns "z2cf"
```


---

x.5-x.5。

```
round(3.000) // 3
round(3.001) // 3
round(3.499) // 3
round(3.500) // 4
round(3.999) // 4

round(-3.000) // -3
round(-3.001) // -3
round(-3.499) // -3
round(-3.500) // -4  *** careful here ***
round(-3.999) // -4
```

。

```
round(3.000) // 3
round(3.001) // 3
round(3.499) // 3
round(3.500) // 4
round(3.999) // 4

round(-3.000) // -3
round(-3.001) // -3
round(-3.499) // -3
round(-3.500) // -4  *** careful here ***
round(-3.999) // -4
```

。

```
round(3.000) // 3
round(3.001) // 3
round(3.499) // 3
round(3.500) // 4
round(3.999) // 4

round(-3.000) // -3
round(-3.001) // -3
round(-3.499) // -3
round(-3.500) // -4  *** careful here ***
round(-3.999) // -4
```

DoubleInt 。

```
round(3.000) // 3
round(3.001) // 3
round(3.499) // 3
round(3.500) // 4
round(3.999) // 4

round(-3.000) // -3
round(-3.001) // -3
round(-3.499) // -3
round(-3.500) // -4  *** careful here ***
round(-3.999) // -4
```

- round ceilfloor6432。

arc4random_uniform(someNumber: UInt32) -> UInt32

0someNumber - 1。

UInt32 4,294,967,295 2^32 - 1 。

-

```
let flip = arc4random_uniform(2) // 0 or 1
```

- ```
  let flip = arc4random_uniform(2) // 0 or 1
  ```
- ```
  let flip = arc4random_uniform(2) // 0 or 1
  ```
- 2090

  ```
  let flip = arc4random_uniform(2) // 0 or 1
  ```

```
let flip = arc4random_uniform(2) // 0 or 1
```

`number maxminUInt32 。`

- `arc4randomarc4random_uniform。`
- `UInt32Int。`

Swift`pow()Double`

```
pow(BASE, EXPONENT)
```

base52

```
pow(BASE, EXPONENT)
```

https://riptutorial.com/zh-TW/swift/topic/454/

36:

Array。 。 ArrayElement。 - 。

- Array <Element> //Element
- [Element] //Element
- [element0element1element2... elementN] //
- [Element] //[Element]
- ArraycountrepeatedValue :) //`countrepeatedValue`
- Array_ :) //

。 。

Examples

。

。

```
var originalArray = ["Swift", "is", "great!"]
var newArray = originalArray
newArray[2] = "awesome!"
//originalArray = ["Swift", "is", "great!"]
//newArray = ["Swift", "is", "awesome!"]
```

。 。

`Array`Swift。 O1。 Array 。

`Array var let` 。

`[Int] IntArray<T>` 。

Swift。

```
// A mutable array of Strings, initially empty.

var arrayOfStrings: [String] = []       // type annotation + array literal
var arrayOfStrings = [String]()         // invoking the [String] initializer
var arrayOfStrings = Array<String>()    // without syntactic sugar
```

```
// A mutable array of Strings, initially empty.

var arrayOfStrings: [String] = []       // type annotation + array literal
var arrayOfStrings = [String]()         // invoking the [String] initializer
var arrayOfStrings = Array<String>()    // without syntactic sugar
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```
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```

```
// A mutable array of Strings, initially empty.

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var arrayOfStrings = [String]()        // invoking the [String] initializer
var arrayOfStrings = Array<String>()   // without syntactic sugar
```

Swift `Int[[Int]]` `Array<Array<Int>>` 。


```
// A mutable array of Strings, initially empty.

var arrayOfStrings: [String] = []      // type annotation + array literal
var arrayOfStrings = [String]()        // invoking the [String] initializer
var arrayOfStrings = Array<String>()   // without syntactic sugar
```



```
// A mutable array of Strings, initially empty.

var arrayOfStrings: [String] = []      // type annotation + array literal
var arrayOfStrings = [String]()        // invoking the [String] initializer
var arrayOfStrings = Array<String>()   // without syntactic sugar
```


```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```


```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```


2`Array` 。 `Array` `Array`0。


```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```


`Array`


```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```

```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```

nil。

```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```

Array。 Arraynil。

```
var exampleArray:[Int] = [1,2,3,4,5]
//exampleArray = [1, 2, 3, 4, 5]
```

```
var exampleArray = [1,2,3,4,5]
exampleArray.isEmpty //false
exampleArray.count //5
```

。

```
var exampleArray = [1,2,3,4,5]
exampleArray.isEmpty //false
exampleArray.count //5
```

```
var exampleArray = [1,2,3,4,5]
exampleArray.append(6)
//exampleArray = [1, 2, 3, 4, 5, 6]
var sixOnwards = [7,8,9,10]
exampleArray += sixOnwards
//exampleArray = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

```
var exampleArray = [1,2,3,4,5]
exampleArray.append(6)
//exampleArray = [1, 2, 3, 4, 5, 6]
var sixOnwards = [7,8,9,10]
exampleArray += sixOnwards
//exampleArray = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
```

```
var array = [3, 2, 1]
```

`ArraySequenceType`。

2.1 2.2

Swift 2`sort()`。

```
var array = [3, 2, 1]
```

3.0

Swift 3sorted() 。

```
var array = [3, 2, 1]
```

ArrayMutableCollectionType 。

2.1 2.2

Swift 2sortInPlace()。

```
var array = [3, 2, 1]
```

3.0

Swift 3sort() 。

```
var array = [3, 2, 1]
```

Comparable。

- Comparable。 LandmarkComparable - 。

```
var array = [3, 2, 1]
```

2.1 2.2

```
var array = [3, 2, 1]
```

3.0

```
var array = [3, 2, 1]
```

。

map_ :)

ArraySequenceType map(_:)AB(A) throws -> B 。

IntString

```
let numbers = [1, 2, 3, 4, 5]
let words = numbers.map { String($0) }
print(words) // ["1", "2", "3", "4", "5"]
```

map(_:)。 。

StringInt

```
let numbers = [1, 2, 3, 4, 5]
```

```
let words = numbers.map { String($0) }
print(words) // ["1", "2", "3", "4", "5"]
```

`map(_:)` transform - `Int`2

```
let numbers = [1, 2, 3, 4, 5]
let words = numbers.map { String($0) }
print(words) // ["1", "2", "3", "4", "5"]
```

flatMap_ :)Array

`things` Array`Any`。

```
let things: [Any] = [1, "Hello", 2, true, false, "World", 3]
```

。 `Int(s)Int` Array。

```
let things: [Any] = [1, "Hello", 2, true, false, "World", 3]
```

`numbers[Int]` 。 `flatMapnil`

```
let things: [Any] = [1, "Hello", 2, true, false, "World", 3]
```

`SequenceTypefilter(_:)`。

`[Int]`

```
let numbers = [22, 41, 23, 30]

let evenNumbers = numbers.filter { $0 % 2 == 0 }

print(evenNumbers)  // [22, 30]
```

30`[Person]`

```
let numbers = [22, 41, 23, 30]

let evenNumbers = numbers.filter { $0 % 2 == 0 }

print(evenNumbers)  // [22, 30]
```

flatMap_ :)nil

`flatMap(_:)map(_:)` 。

```
extension SequenceType {
    public func flatMap<T>(@noescape transform: (Self.Generator.Element) throws -> T?)
rethrows -> [T]
}
```

flatMap(_:)OptionalT?。 nil - [T]。

IntString[String][Int]

```
extension SequenceType {
    public func flatMap<T>(@noescape transform: (Self.Generator.Element) throws -> T?)
rethrows -> [T]
}
```

flatMap(_:)nil

```
extension SequenceType {
    public func flatMap<T>(@noescape transform: (Self.Generator.Element) throws -> T?)
rethrows -> [T]
}
```

RangeArray。

```
let words = ["Hey", "Hello", "Bonjour", "Welcome", "Hi", "Hola"]
let range = 2...4
let slice = words[range] // ["Bonjour", "Welcome", "Hi"]
```

RangeArraySlice 。 Array。

ArraySlice<String> 。

ArraySliceCollectionTypesort filter。

Array()

```
let words = ["Hey", "Hello", "Bonjour", "Welcome", "Hi", "Hola"]
let range = 2...4
let slice = words[range] // ["Bonjour", "Welcome", "Hi"]
```

```
let words = ["Hey", "Hello", "Bonjour", "Welcome", "Hi", "Hola"]
let range = 2...4
let slice = words[range] // ["Bonjour", "Welcome", "Hi"]
```

```
struct Box {
    let name: String
    let thingsInside: Int
}
```

Box(es)

```
struct Box {
    let name: String
    let thingsInside: Int
}
```

thingsInsidethingsInside Dictionary key。

```
struct Box {
    let name: String
    let thingsInside: Int
}
```

`[Int:[Box]]`

```
struct Box {
    let name: String
    let thingsInside: Int
}
```

flatMap_ :)

`nil flatMap(_:)S`

```
extension SequenceType {
    public func flatMap<S : SequenceType>(transform: (Self.Generator.Element) throws -> S)
rethrows -> [S.Generator.Element]
}
```

- `[S.Generator.Element]` ◦

```
extension SequenceType {
    public func flatMap<S : SequenceType>(transform: (Self.Generator.Element) throws -> S)
rethrows -> [S.Generator.Element]
}
```

1. `primes[String] flatMap(_:)` ◦
2. `primesString Array<String>.Generator.Element` ◦
3. `String.CharacterView`◦
4. - `[String.CharacterView.Generator.Element]` ◦

`flatMap(_:)` - 2D1D3D2D◦

`$0`

```
extension SequenceType {
    public func flatMap<S : SequenceType>(transform: (Self.Generator.Element) throws -> S)
rethrows -> [S.Generator.Element]
}
```

3.0

`sorted()`

```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```

`sort()`

```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```


```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```

```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```

```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```

```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```


import Foundation NSString caseInsensitiveCompare


```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```


localizedCaseInsensitiveCompare ◦

.numericcompare


```
let words = ["Hello", "Bonjour", "Salute", "Ahola"]
let sortedWords = words.sorted()
print(sortedWords) // ["Ahola", "Bonjour", "Hello", "Salute"]
```


flatten

flatten() ◦

2D1D

```
// A 2D array of type [[Int]]
let array2D = [[1, 3], [4], [6, 8, 10], [11]]

// A FlattenBidirectionalCollection<[[Int]]>
let lazilyFlattenedArray = array2D.flatten()

print(lazilyFlattenedArray.contains(4)) // true
```

flatten() FlattenBidirectionalCollection ◦ contains(_:) array2Darray2D - ◦

Arrayreduce_combine :)

reduce(_:combine:)。 - 。

```
let numbers = [2, 5, 7, 8, 10, 4]

let sum = numbers.reduce(0) {accumulator, element in
    return accumulator + element
}

print(sum) // 36
```

0。 NsumN + 36 。 reduce。 accumulator。 element。

(Int, Int) -> Intreduce - +Swift

```
let numbers = [2, 5, 7, 8, 10, 4]

let sum = numbers.reduce(0) {accumulator, element in
    return accumulator + element
}

print(sum) // 36
```

remove(at:)。

Swift3

```
extension Array where Element: Equatable {

    mutating func remove(_ element: Element) {
        _ = index(of: element).flatMap {
            self.remove(at: $0)
        }
    }
}
```

```
extension Array where Element: Equatable {

    mutating func remove(_ element: Element) {
        _ = index(of: element).flatMap {
            self.remove(at: $0)
        }
    }
}
```

array.remove(25) -
cannot convert value to expected argument type

2.1 2.2

minElement()maxElement()。

```
let numbers = [2, 6, 1, 25, 13, 7, 9]

let minimumNumber = numbers.minElement() // Optional(1)
let maximumNumber = numbers.maxElement() // Optional(25)
```

3.0

Swift 3`min()` `max()`

```
let numbers = [2, 6, 1, 25, 13, 7, 9]

let minimumNumber = numbers.minElement() // Optional(1)
let maximumNumber = numbers.maxElement() // Optional(25)
```

- `nil` 。

  `Comparable`。

`Comparable`。

```
let numbers = [2, 6, 1, 25, 13, 7, 9]

let minimumNumber = numbers.minElement() // Optional(1)
let maximumNumber = numbers.maxElement() // Optional(25)
```

2.1 2.2

```
let numbers = [2, 6, 1, 25, 13, 7, 9]

let minimumNumber = numbers.minElement() // Optional(1)
let maximumNumber = numbers.maxElement() // Optional(25)
```

3.0

```
let numbers = [2, 6, 1, 25, 13, 7, 9]

let minimumNumber = numbers.minElement() // Optional(1)
let maximumNumber = numbers.maxElement() // Optional(25)
```

。

```
extension Array {
    subscript (safe index: Int) -> Element? {
        return indices ~= index ? self[index] : nil
    }
}
```

```
extension Array {
    subscript (safe index: Int) -> Element? {
        return indices ~= index ? self[index] : nil
    }
}
```

2

`zipSequenceType`2`Zip2Sequence` 。

```
let nums = [1, 2, 3]
let animals = ["Dog", "Cat", "Tiger"]
let numsAndAnimals = zip(nums, animals)
```

nomsAndAnimals

1	1
1	"Dog"
2	"Cat"
3	"Tiger"

n。

2`Int(s)`

```
let nums = [1, 2, 3]
let animals = ["Dog", "Cat", "Tiger"]
let numsAndAnimals = zip(nums, animals)
```

`list1list0list0` 。

```
let nums = [1, 2, 3]
let animals = ["Dog", "Cat", "Tiger"]
let numsAndAnimals = zip(nums, animals)
```

https://riptutorial.com/zh-TW/swift/topic/284/

37:

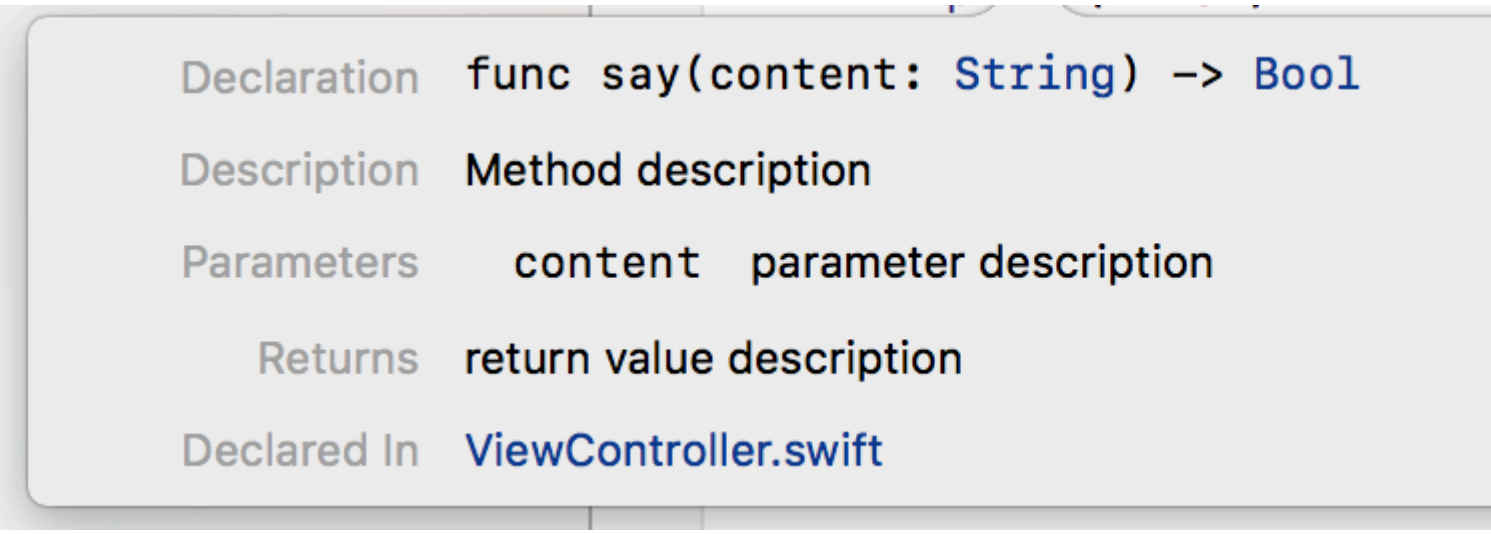
Examples

```
/// Class description
class Student {

    // Member description
    var name: String

    /// Method description
    ///
    /// - parameter content:   parameter description
    ///
    /// - returns: return value description
    func say(content: String) -> Bool {
        print("\(self.name) say \(content)")
        return true
    }
}
```

Xcode 8 ▯▯ + ▯▯ + /。

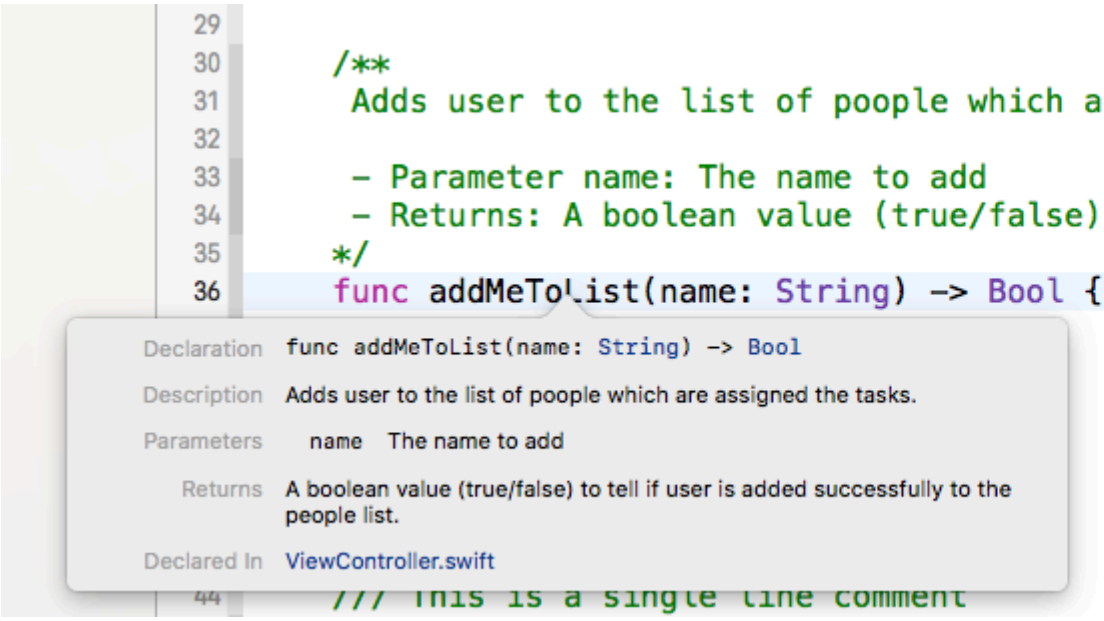



```
/**
 Adds user to the list of poople which are assigned the tasks.

 - Parameter name: The name to add
 - Returns: A boolean value (true/false) to tell if user is added successfully to the people
list.
*/
func addMeToList(name: String) -> Bool {

    // Do something....


    return true
}
```




```
/**
 Adds user to the list of poople which are assigned the tasks.

 - Parameter name: The name to add
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*/
func addMeToList(name: String) -> Bool {

    // Do something....


    return true
}
```


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 Adds user to the list of poople which are assigned the tasks.

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 - Returns: A boolean value (true/false) to tell if user is added successfully to the people
list.
*/
func addMeToList(name: String) -> Bool {

    // Do something....


    return true
}
```
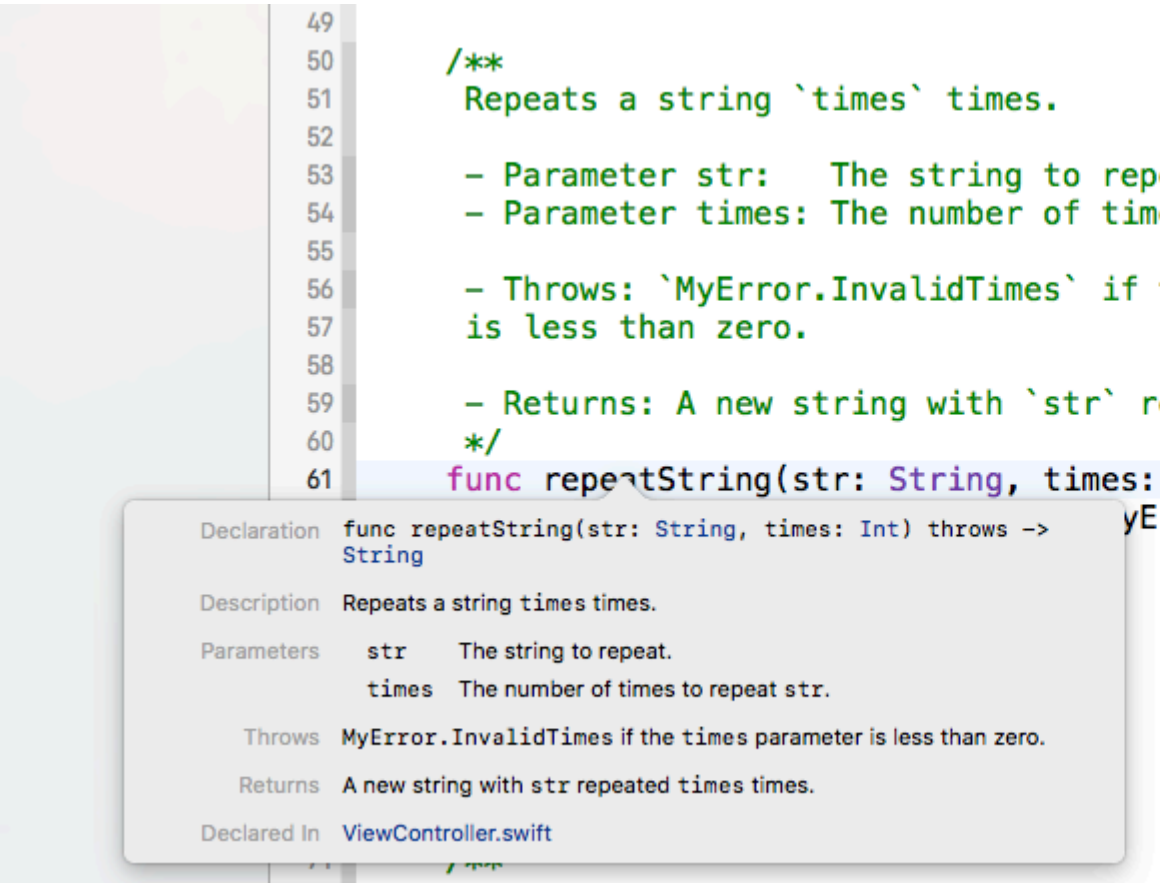
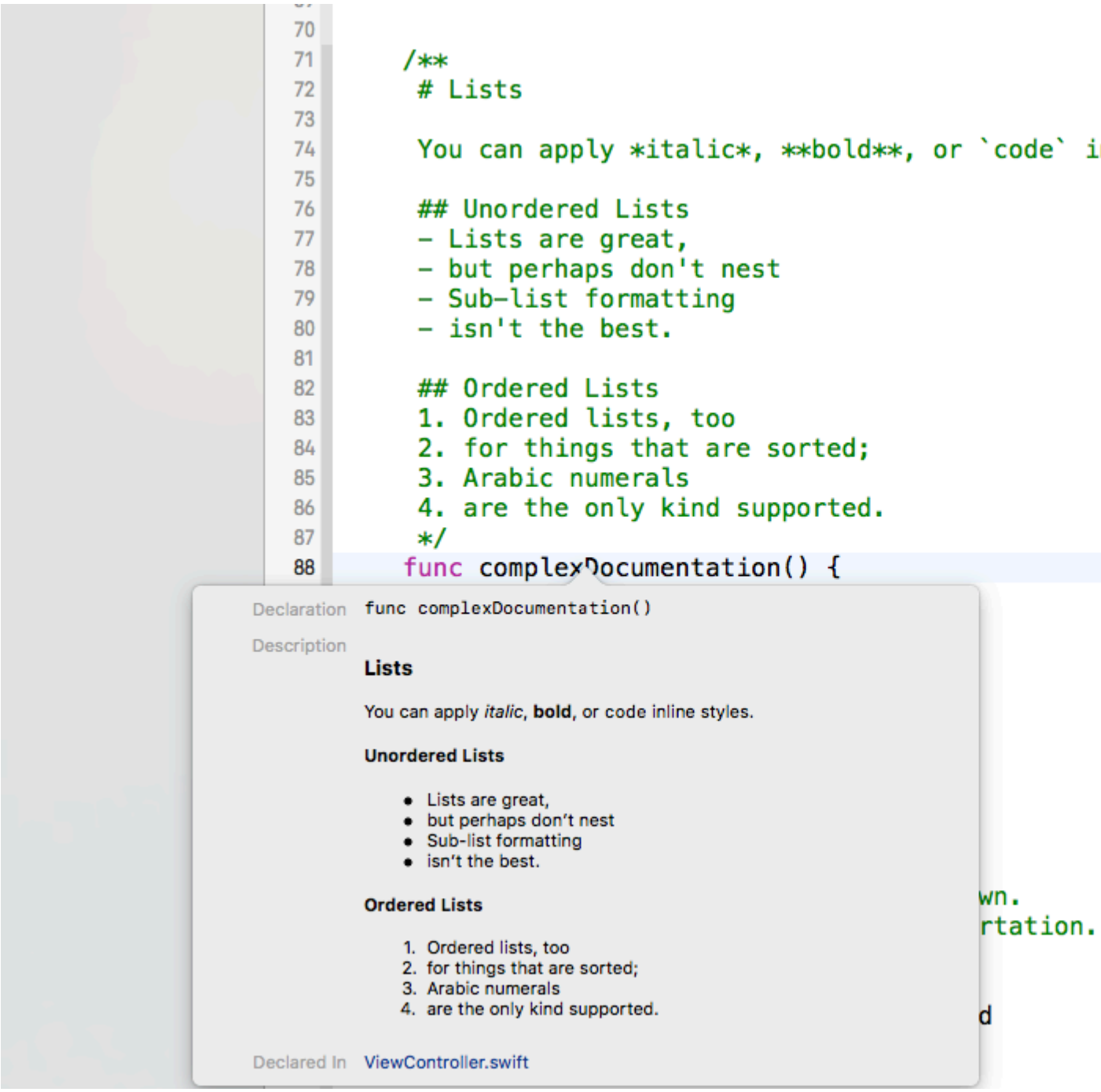
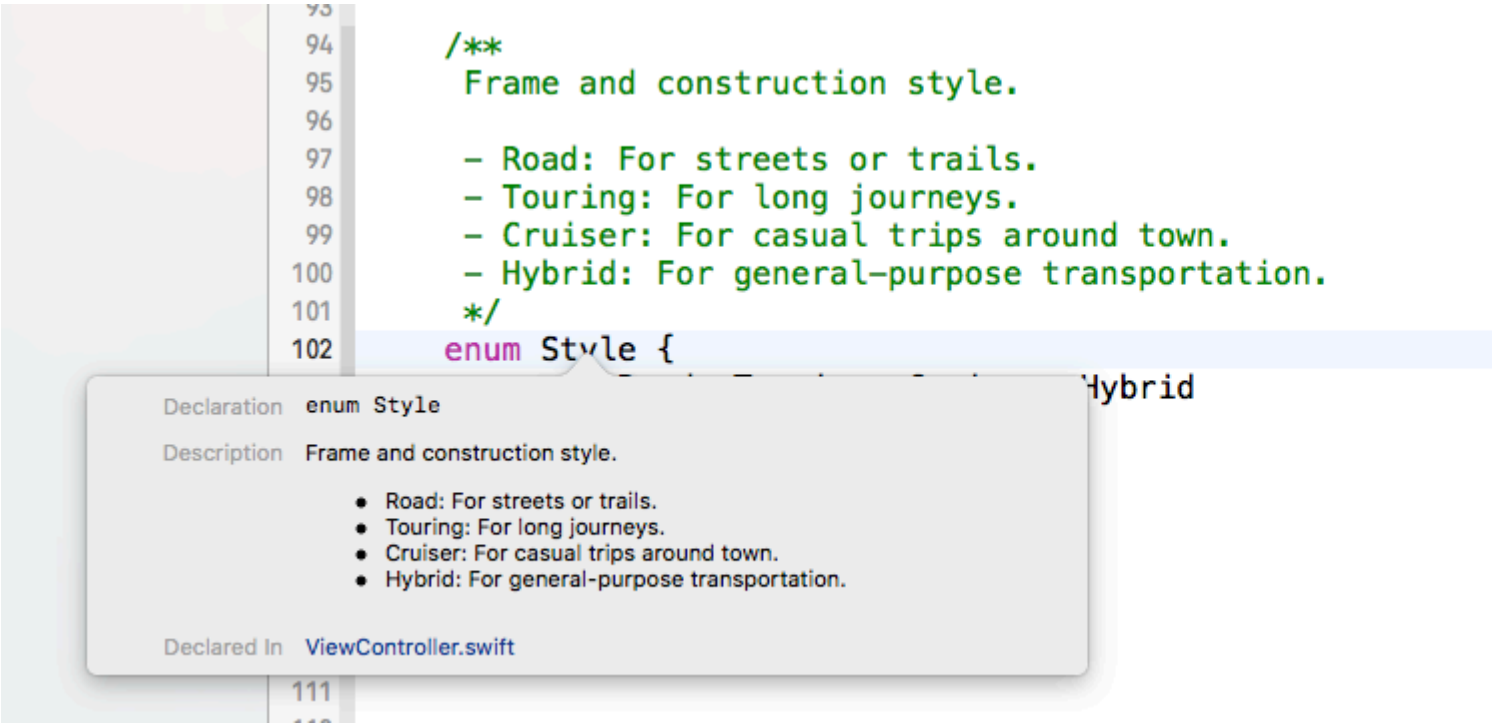




```
/**
 Adds user to the list of poople which are assigned the tasks.

 - Parameter name: The name to add
 - Returns: A boolean value (true/false) to tell if user is added successfully to the people
list.
*/
func addMeToList(name: String) -> Bool {

    // Do something....


    return true
}
```




```
/**
 Adds user to the list of poople which are assigned the tasks.

 - Parameter name: The name to add
 - Returns: A boolean value (true/false) to tell if user is added successfully to the people
list.
*/
func addMeToList(name: String) -> Bool {

    // Do something....


    return true
}
```



https://riptutorial.com/zh-TW/swift/topic/6937/

38:

Swift/

- `NSObject`
- `dynamic`

SwiftCocoaObjective-C

`@objc`Swift APIObjective-C。 *SwiftObjective-C* 。 `dynamic`。 Objective-C`dynamic``@objc`。

。 **API`dynamic`** 。 Objective-C`method_exchangeImplementations`。 Swift 。

Objective-C

NSHipster

Examples

UIViewControllerSwizzling viewDidLoad

Objective-C。 。

Objective-CPure Swift`NSObject`。

`UIViewController`swizzle `viewDidLoad`

```
extension UIViewController {

    // We cannot override load like we could in Objective-C, so override initialize instead
    public override static func initialize() {

        // Make a static struct for our dispatch token so only one exists in memory
        struct Static {
            static var token: dispatch_once_t = 0
        }

        // Wrap this in a dispatch_once block so it is only run once
        dispatch_once(&Static.token) {
            // Get the original selectors and method implementations, and swap them with our
new method
            let originalSelector = #selector(UIViewController.viewDidLoad)
            let swizzledSelector = #selector(UIViewController.myViewDidLoad)

            let originalMethod = class_getInstanceMethod(self, originalSelector)
            let swizzledMethod = class_getInstanceMethod(self, swizzledSelector)

            let didAddMethod = class_addMethod(self, originalSelector,
method_getImplementation(swizzledMethod), method_getTypeEncoding(swizzledMethod))

            // class_addMethod can fail if used incorrectly or with invalid pointers, so check
to make sure we were able to add the method to the lookup table successfully
            if didAddMethod {
```

```
                class_replaceMethod(self, swizzledSelector,
method_getImplementation(originalMethod), method_getTypeEncoding(originalMethod))
            } else {
                method_exchangeImplementations(originalMethod, swizzledMethod);
            }
        }
    }

    // Our new viewDidLoad function
    // In this example, we are just logging the name of the function, but this can be used to
run any custom code
    func myViewDidLoad() {
        // This is not recursive since we swapped the Selectors in initialize().
        // We cannot call super in an extension.
        self.myViewDidLoad()
        print(#function) // logs myViewDidLoad()
    }
}
```

Swift Swizzling

`methodOne()methodTwo()TestSwizzling`

```
class TestSwizzling : NSObject {
    dynamic func methodOne()->Int{
        return 1
    }
}

extension TestSwizzling {

    //In Objective-C you'd perform the swizzling in load(),
    //but this method is not permitted in Swift
    override class func initialize()
    {

        struct Inner {
            static let i: () = {

                let originalSelector = #selector(TestSwizzling.methodOne)
                let swizzledSelector = #selector(TestSwizzling.methodTwo)
                let originalMethod = class_getInstanceMethod(TestSwizzling.self,
originalSelector);
                let swizzledMethod = class_getInstanceMethod(TestSwizzling.self,
swizzledSelector)
                method_exchangeImplementations(originalMethod, swizzledMethod)
            }
        }
        let _ = Inner.i
    }

    func methodTwo()->Int{
        // It will not be a recursive call anymore after the swizzling
        return methodTwo()+1
    }
}

var c = TestSwizzling()
print(c.methodOne())
```

```
print(c.methodTwo())
```

Swizzling - Objective-C

- UIView`initWithFrame:`

```
static IMP original_initWithFrame;

+ (void)swizzleMethods {
    static BOOL swizzled = NO;
    if (!swizzled) {
        swizzled = YES;

        Method initWithFrameMethod =
            class_getInstanceMethod([UIView class], @selector(initWithFrame:));
        original_initWithFrame = method_setImplementation(
            initWithFrameMethod, (IMP)replacement_initWithFrame);
    }
}

static id replacement_initWithFrame(id self, SEL _cmd, CGRect rect) {

    // This will be called instead of the original initWithFrame method on UIView
    // Do here whatever you need...

    // Bonus: This is how you would call the original initWithFrame method
    UIView *view =
        ((id (*)(id, SEL, CGRect))original_initWithFrame)(self, _cmd, rect);

    return view;
}
```

https://riptutorial.com/zh-TW/swift/topic/1436/

39:

。

Swift 。

Examples

```
enum Direction {
    case up
    case down
    case left
    case right
}

enum Direction { case up, down, left, right }
```

```
enum Direction {
    case up
    case down
    case left
    case right
}

enum Direction { case up, down, left, right }
```

/`switch`

```
enum Direction {
    case up
    case down
    case left
    case right
}

enum Direction { case up, down, left, right }
```

`Hashable` `Equatable`

```
enum Direction {
    case up
    case down
    case left
    case right
}

enum Direction { case up, down, left, right }
```

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
```

```
}
```

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
}
```

switch

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
}
```

if case

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
}
```

guard case

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
}
```

Equatable ◦ ==

```
enum Action {
    case jump
    case kick
    case move(distance: Float)  // The "move" case has an associated distance
}
```

```
enum Tree<T> {
    case leaf(T)
    case branch(Tree<T>, Tree<T>)  // error: recursive enum 'Tree<T>' is not marked 'indirect'
}
```

indirect◦

```
enum Tree<T> {
    case leaf(T)
    case branch(Tree<T>, Tree<T>)  // error: recursive enum 'Tree<T>' is not marked 'indirect'
}
```

indirect

```
enum Tree<T> {
    case leaf(T)
    case branch(Tree<T>, Tree<T>)  // error: recursive enum 'Tree<T>' is not marked 'indirect'
}
```

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

rawValue

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

0

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

RawRepresentable ◦ `.rawValue`

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

`init?(rawValue:)`

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

hashValue。

```
enum Rotation: Int {
    case up = 0
    case left = 90
    case upsideDown = 180
    case right = 270
}
```

init`init?(rawValue:)init?(rawValue:)` 。 。 。

```
enum CompassDirection {
    case north(Int)
    case south(Int)
    case east(Int)
    case west(Int)

    init?(degrees: Int) {
        switch degrees {
        case 0...45:
            self = .north(degrees)
        case 46...135:
            self = .east(degrees)
        case 136...225:
            self = .south(degrees)
        case 226...315:
            self = .west(degrees)
        case 316...360:
            self = .north(degrees)
        default:
            return nil
        }
    }

    var value: Int = {
        switch self {
            case north(let degrees):
                return degrees
            case south(let degrees):
                return degrees
            case east(let degrees):
                return degrees
            case west(let degrees):
                return degrees
        }
    }
}
```

```
enum CompassDirection {
    case north(Int)
    case south(Int)
    case east(Int)
    case west(Int)

    init?(degrees: Int) {
        switch degrees {
        case 0...45:
            self = .north(degrees)
```

```
        case 46...135:
            self = .east(degrees)
        case 136...225:
            self = .south(degrees)
        case 226...315:
            self = .west(degrees)
        case 316...360:
            self = .north(degrees)
        default:
            return nil
        }
    }

    var value: Int = {
        switch self {
            case north(let degrees):
                return degrees
            case south(let degrees):
                return degrees
            case east(let degrees):
                return degrees
            case west(let degrees):
                return degrees
        }
    }
}
```

SwiftC。 。

```
protocol ChangesDirection {
    mutating func changeDirection()
}

enum Direction {

    // enumeration cases
    case up, down, left, right

    // initialise the enum instance with a case
    // that's in the opposite direction to another
    init(oppositeTo otherDirection: Direction) {
        self = otherDirection.opposite
    }

    // computed property that returns the opposite direction
    var opposite: Direction {
        switch self {
        case .up:
            return .down
        case .down:
            return .up
        case .left:
            return .right
        case .right:
            return .left
        }
    }
}

// extension to Direction that adds conformance to the ChangesDirection protocol
```

```
extension Direction: ChangesDirection {
    mutating func changeDirection() {
        self = .left
    }
}
```

```
protocol ChangesDirection {
    mutating func changeDirection()
}

enum Direction {

    // enumeration cases
    case up, down, left, right

    // initialise the enum instance with a case
    // that's in the opposite direction to another
    init(oppositeTo otherDirection: Direction) {
        self = otherDirection.opposite
    }

    // computed property that returns the opposite direction
    var opposite: Direction {
        switch self {
        case .up:
            return .down
        case .down:
            return .up
        case .left:
            return .right
        case .right:
            return .left
        }
    }
}

// extension to Direction that adds conformance to the ChangesDirection protocol
extension Direction: ChangesDirection {
    mutating func changeDirection() {
        self = .left
    }
}
```

。

```
enum Orchestra {
    enum Strings {
        case violin
        case viola
        case cello
        case doubleBasse
    }

    enum Keyboards {
        case piano
        case celesta
        case harp
    }
```

```
    enum Woodwinds {
        case flute
        case oboe
        case clarinet
        case bassoon
        case contrabassoon
    }
}
```

```
enum Orchestra {
    enum Strings {
        case violin
        case viola
        case cello
        case doubleBasse
    }

    enum Keyboards {
        case piano
        case celesta
        case harp
    }

    enum Woodwinds {
        case flute
        case oboe
        case clarinet
        case bassoon
        case contrabassoon
    }
}
```

https://riptutorial.com/zh-TW/swift/topic/224/

40:

ifelse ifelseSwiftTrueFalse。 Swift。

Swift 。

Examples

Guard

2.0

Guardfalse。 `return breakcontinue`;。 `guard ifif`。

。

```
func printNum(num: Int) {
    guard num == 10 else {
        print("num is not 10")
        return
    }
    print("num is 10")
}
```

Guard

```
func printNum(num: Int) {
    guard num == 10 else {
        print("num is not 10")
        return
    }
    print("num is 10")
}
```

Guard`where`

```
func printNum(num: Int) {
    guard num == 10 else {
        print("num is not 10")
        return
    }
    print("num is 10")
}
```

if

`if`Bool`true`

```
let num = 10
```

```
if num == 10 {
    // Code inside this block only executes if the condition was true.
    print("num is 10")
}

let condition = num == 10   // condition's type is Bool
if condition {
    print("num is 10")
}
```

`if`**`else if`**`else`

```
let num = 10

if num == 10 {
    // Code inside this block only executes if the condition was true.
    print("num is 10")
}

let condition = num == 10   // condition's type is Bool
if condition {
    print("num is 10")
}
```

`&&` `||`

AND

```
let num = 10

if num == 10 {
    // Code inside this block only executes if the condition was true.
    print("num is 10")
}

let condition = num == 10   // condition's type is Bool
if condition {
    print("num is 10")
}
```

`num == 10`false。 。

OR

```
let num = 10

if num == 10 {
    // Code inside this block only executes if the condition was true.
    print("num is 10")
}

let condition = num == 10   // condition's type is Bool
if condition {
    print("num is 10")
```

```
}
```

`num == 10`true。

NOT

```
let num = 10

if num == 10 {
    // Code inside this block only executes if the condition was true.
    print("num is 10")
}

let condition = num == 10   // condition's type is Bool
if condition {
    print("num is 10")
}
```

“where”

- `if let` **`nil`**

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

1.2 3.0

,

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

where

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

where

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

3.0

3 `where` SE-0099 ,。

```
let num: Int? = 10 // or: let num: Int? = nil

if let unwrappedNum = num {
    // num has type Int?; unwrappedNum has type Int
    print("num was not nil: \(unwrappedNum + 1)")
} else {
    print("num was nil")
}
```

if

```
let a = 5
let b = 10
let min: Int

if a < b {
    min = a
} else {
    min = b
}

let max: Int

if a > b {
    max = a
} else {
    max = b
}
```

truefalse。

```
let a = 5
let b = 10
let min: Int

if a < b {
    min = a
} else {
    min = b
}

let max: Int

if a > b {
    max = a
} else {
    max = b
}
```

```
let a = 5
let b = 10
let min: Int

if a < b {
    min = a
} else {
    min = b
}

let max: Int

if a > b {
    max = a
} else {
    max = b
}
```

a <b。 mina;b。

Swiftmaxmin。

Nil-Coalescing

<OPTIONAL> ?? <DEFAULT VALUE><OPTIONAL><OPTIONAL>n<DEFAULT VALUE> 。 <OPTIONAL>。 <DEFAULT VALUE> <OPTIONAL>。

nil-coalescing

```
a != nil ? a! : b
```

```
a != nil ? a! : b
```

```
a != nil ? a! : b
```

https://riptutorial.com/zh-TW/swift/topic/475/

41:

。 。

SwiftSwift。 SwiftArrayDictionary。 IntStringSwift。 。

AppleSwift

Examples

Equatable

```
class MyGenericClass<Type: Equatable>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }

    func valueEquals(anotherValue: Type) -> Bool{
        return self.value == anotherValue
    }
}
```

MyGenericClass typeEquatable==type

```
class MyGenericClass<Type: Equatable>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }

    func valueEquals(anotherValue: Type) -> Bool{
        return self.value == anotherValue
    }
}
```

。 Any。

<>。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
```

```
}
```

TSwiftT。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

。 SwiftT == Int - (Int, Int) -> Int 。

- 。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

Bar。 init(baz:T)。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

TStringBar<String>。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

。 baz String。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

。

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
```

```
    return arc4random_uniform(2) == 0 ? a : b
}
```

Bar<Int> ◦ IntBar◦

◦ ◦ SwiftArrayElementArray◦

```
/// Picks one of the inputs at random, and returns it
func pickRandom<T>(_ a:T, _ b:T) -> T {
    return arc4random_uniform(2) == 0 ? a : b
}
```

Type

```
class MyGenericClass<Type>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }

    func setValue(value: Type){
        self.value = value
    }
}
```

```
class MyGenericClass<Type>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }

    func setValue(value: Type){
        self.value = value
    }
}
```

```
class MyGenericClass<Type>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }
```

```
    func setValue(value: Type){
        self.value = value
    }
}
```

```
class MyGenericClass<Type>{

    var value: Type
    init(value: Type){
        self.value = value
    }

    func getValue() -> Type{
        return self.value
    }

    func setValue(value: Type){
        self.value = value
    }
}
```

```
// Models
class MyFirstModel {
}

class MySecondModel: MyFirstModel {
}

// Generic classes
class MyFirstGenericClass<T: MyFirstModel> {

    func doSomethingWithModel(model: T) {
        // Do something here
    }

}

class MySecondGenericClass<T: MySecondModel>: MyFirstGenericClass<T> {

    override func doSomethingWithModel(model: T) {
        super.doSomethingWithModel(model)

        // Do more things here
    }

}
```

。

```
// Need to restrict the extension to elements that can be compared.
// The `Element` is the generics name defined by Array for its item types.
// This restriction also gives us access to `index(of:_)` which is also
// defined in an Array extension with `where Element: Equatable`.
public extension Array where Element: Equatable {
    /// Removes the given object from the array.
    mutating func remove(_ element: Element) {
        if let index = self.index(of: element ) {
```

```
            self.remove(at: index)
        } else {
            fatalError("Removal error, no such element:\"\(element)\" in array.\n")
        }
    }
}
```

```
// Need to restrict the extension to elements that can be compared.
// The `Element` is the generics name defined by Array for its item types.
// This restriction also gives us access to `index(of:_)` which is also
// defined in an Array extension with `where Element: Equatable`.
public extension Array where Element: Equatable {
    /// Removes the given object from the array.
    mutating func remove(_ element: Element) {
        if let index = self.index(of: element ) {
            self.remove(at: index)
        } else {
            fatalError("Removal error, no such element:\"\(element)\" in array.\n")
        }
    }
}
```

。 。


```
// Need to restrict the extension to elements that can be compared.
// The `Element` is the generics name defined by Array for its item types.
// This restriction also gives us access to `index(of:_)` which is also
// defined in an Array extension with `where Element: Equatable`.
public extension Array where Element: Equatable {
    /// Removes the given object from the array.
    mutating func remove(_ element: Element) {
        if let index = self.index(of: element ) {
            self.remove(at: index)
        } else {
            fatalError("Removal error, no such element:\"\(element)\" in array.\n")
        }
    }
}
```


```
protocol JSONDecodable {
    static func from(_ json: [String: Any]) -> Any?
}
```

。


```
protocol JSONDecodable {
    static func from(_ json: [String: Any]) -> Any?
}
```


TestObject Any。


```
protocol JSONDecodable {
    static func from(_ json: [String: Any]) -> Any?
}
```

where

```
func doSomething<T where T: Comparable, T: Hashable>(first: T, second: T) {
    // Access hashable function
    guard first.hashValue == second.hashValue else {
        return
    }
    // Access comparable function
    if first == second {
        print("\(first) and \(second) are equal.")
    }
}
```

where

```
func doSomething<T where T: Comparable, T: Hashable>(first: T, second: T) {
    // Access hashable function
    guard first.hashValue == second.hashValue else {
        return
    }
    // Access comparable function
    if first == second {
        print("\(first) and \(second) are equal.")
    }
}
```

。

```
func doSomething<T where T: Comparable, T: Hashable>(first: T, second: T) {
    // Access hashable function
    guard first.hashValue == second.hashValue else {
        return
    }
    // Access comparable function
    if first == second {
        print("\(first) and \(second) are equal.")
    }
}
```

https://riptutorial.com/zh-TW/swift/topic/774/

42: Swift

`println``debugPrintln`Swift 2.0。

https://developer.apple.com/library/content/technotes/tn2347/_index.html
http://ericasadun.com/2015/05/22/swift-logging/

http://www.dotnetperls.com/print-swift

Examples

Debug Print。

```
print("Hello")
debugPrint("Hello")

let dict = ["foo": 1, "bar": 2]

print(dict)
debugPrint(dict)
```

```
print("Hello")
debugPrint("Hello")

let dict = ["foo": 1, "bar": 2]

print(dict)
debugPrint(dict)
```

```
print("Hello")
debugPrint("Hello")

let dict = ["foo": 1, "bar": 2]

print(dict)
debugPrint(dict)
```

```
print("Hello")
debugPrint("Hello")

let dict = ["foo": 1, "bar": 2]

print(dict)
debugPrint(dict)
```

43。 `debugPrint`

```
print("Hello")
debugPrint("Hello")

let dict = ["foo": 1, "bar": 2]

print(dict)
debugPrint(dict)
```

dump◦

```
let names = ["Joe", "Jane", "Jim", "Joyce"]
dump(names)
```

▿4
- [0]
- [1]
- [2]
- [3]

```
let names = ["Joe", "Jane", "Jim", "Joyce"]
dump(names)
```

▿3/
▿[0] :(2
- .0
- .133
▿[1] :(2
- .0baz
- .142
▿[2] :(2
- .0foo
- .110

dumpdump(_:name:indent:maxDepth:maxItems:) ◦

◦

name

```
let names = ["Joe", "Jane", "Jim", "Joyce"]
dump(names)
```

▿3/
▿[0] :(2
- .0
- .133
▿[1] :(2
- .0baz

- .142
▿[2] :(2
- .0foo
- .110

maxItems:maxDepth:indent: ◦

printvs dump

print()◦

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

Abc

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

print()

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

dump()

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

dump()print()◦

dump()UI

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

dump(view)

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

`print(view)`

```
class Abc {
    let a = "aa"
    let b = "bb"
}
```

`dump()`。

vs NSLog

swift`print()` `NSLog()` Xcode。

`print()` `NSLog()`

1 TimeStamp `NSLog()` `print()`。

```
let array = [1, 2, 3, 4, 5]
print(array)
NSLog(array.description)
```

> [1,2,3,4,5]
> 2017-05-31 131438.582 ProjetName [22867473287] [1,2,3,4,5]

ProjectName。

2 Only String `NSLog()` String`print()`。

```
let array = [1, 2, 3, 4, 5]
print(array)
NSLog(array.description)
```

3`print()` `NSLog()` 。

4 `NSLog()`。 `print()`。

5 `NSLog()` Xcode。 `print()`。

Swift https://riptutorial.com/zh-TW/swift/topic/3966/swift

43:

Examples

。

Swift。

“”。 “”。

“”

objective-c“objc_getAssociatedObject”_set。

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

。

1. “class”。
2. “where selfUIViewController”。

“p”

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

“”“p”

“p”。

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

。 。

Xcode “p”。

“p”viewDidLoad。

p 。 p。 p“”“p”。 Xcode“p”。

“p”。 viewDidLoad。

。

“p”getter 。

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

。 Xcode p。 pviewDidLoad。

.....

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

。 。

```
get {
   return objc_getAssociatedObject(self, & _Handle) as! YourType
   }
set {
   objc_setAssociatedObject(self, & _Handle, newValue, .OBJC_ASSOCIATION_RETAIN)
    }
```

_aoGetPP“”0。

https://riptutorial.com/zh-TW/swift/topic/1085/

44:

Examples

```
struct Repository {
    let identifier: Int
    let name: String
    var description: String?
}
```

`Repositoryidentifier namedescription` ◦ `identifiernamelet` -keyword◦ ◦ ◦ ◦

◦ ◦

`Repositorydescription nil` ◦

```
struct Repository {
    let identifier: Int
    let name: String
    var description: String?
}
```

```
first = "Hello"
second = first
first += " World!"
// first == "Hello World!"
// second == "Hello"
```

String◦

```
first = "Hello"
second = first
first += " World!"
// first == "Hello World!"
// second == "Hello"
```

◦

◦

structstruct`mutating`

```
struct Counter {
    private var value = 0

    mutating func next() {
        value += 1
    }
}
```

`mutating`struct。

```
struct Counter {
    private var value = 0

    mutating func next() {
        value += 1
    }
}
```

`mutating`struct

```
struct Counter {
    private var value = 0

    mutating func next() {
        value += 1
    }
}
```

```
class MyView: NSView { }  // works

struct MyInt: Int { } // error: inheritance from non-protocol type 'Int'
```


```
class MyView: NSView { }  // works

struct MyInt: Int { } // error: inheritance from non-protocol type 'Int'
```


struct

Swift“”。

```
struct DeliveryRange {
  var range: Double
  let center: Location
}
let storeLocation = Location(latitude: 44.9871,
                             longitude: -93.2758)
var pizzaRange = DeliveryRange(range: 200,
                               center: storeLocation)
```


```
struct DeliveryRange {
  var range: Double
  let center: Location
}
let storeLocation = Location(latitude: 44.9871,
                             longitude: -93.2758)
var pizzaRange = DeliveryRange(range: 200,
                               center: storeLocation)
```


```
struct DeliveryRange {
  var range: Double
```

```
  let center: Location
}
let storeLocation = Location(latitude: 44.9871,
                             longitude: -93.2758)
var pizzaRange = DeliveryRange(range: 200,
                               center: storeLocation)
```

。

```
struct DeliveryRange {
  var range: Double
  let center: Location
}
let storeLocation = Location(latitude: 44.9871,
                             longitude: -93.2758)
var pizzaRange = DeliveryRange(range: 200,
                               center: storeLocation)
```

https://riptutorial.com/zh-TW/swift/topic/255/

45:

URLSessionFileManager

Examples

```
let url = "https://path-to-media"
let request = URLRequest(url: url)
let downloadTask = URLSession.shared.downloadTask(with: request) { (location, response, error)
in
  guard let location = location,
        let response = response,
        let documentsPath = NSSearchPathForDirectoriesInDomains(.documentDirectory,
.userDomainMask, true).first else {
    return
  }
  let documentsDirectoryUrl = URL(fileURLWithPath: documentsPath)
  let documentUrl = documentsDirectoryUrl.appendingPathComponent(response.suggestedFilename)
  let _ = try? FileManager.default.moveItem(at: location, to: documentUrl)

  // documentUrl is the local URL which we just downloaded and saved to the FileManager
}.resume()
```

```
let url = "https://path-to-media"
guard let documentsUrl = FileManager.default.urls(for: .documentDirectory, in:
.userDomainMask).first,
      let searchQuery = url.absoluteString.components(separatedBy: "/").last else {
  return nil
}

do {
  let directoryContents = try FileManager.default.contentsOfDirectory(at: documentsUrl,
includingPropertiesForKeys: nil, options: [])
  let cachedFiles = directoryContents.filter { $0.absoluteString.contains(searchQuery) }

  // do something with the files found by the url
} catch {
  // Could not find any files
}
```

https://riptutorial.com/zh-TW/swift/topic/8902/

46:

-
- car = Car“Ford”“Escape”//
- public enum
- private func calculateMarketCap
- setupView
- privatesetvar area = 0

1.

。 。

。 。

。

2.

。

3. ***GetterSetter***

propertysetterprivategetterinternal。 gettersetter。

4.

InitializersProtocolsExtensionsGenericsType Aliases

Examples

Struct

3.0

Swift 3。 `open`

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
```

```
}
```

myCar

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

Car.make

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

Car。

Car.model

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

`Car`。

Car.otherNamefileprivate

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

`Car` 。

Car.fullName

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

Swift 3。 `privatestruct` / `class`。

```
public struct Car {

    public let make: String
    let model: String //Optional keyword: will automatically be "internal"
    private let fullName: String
    fileprivate var otherName: String

    public init(_ make: String, model: String) {
        self.make = make
        self.model = model
        self.fullName = "\(make)\(model)"
        self.otherName = "\(model) - \(make)"
    }
}
```

Swift。 。

```
public class SuperClass {
    private func secretMethod() {}
}

internal class SubClass: SuperClass {
    override internal func secretMethod() {
        super.secretMethod()
    }
}
```

GettersSetters

```
struct Square {
    private(set) var area = 0

    var side: Int = 0 {
        didSet {
            area = side*side
        }
    }
}

public struct Square {
    public private(set) var area = 0
    public var side: Int = 0 {
        didSet {
            area = side*side
        }
    }
    public init() {}
}
```

https://riptutorial.com/zh-TW/swift/topic/1075/

47: -

。 。

。

Examples

。

Foostatic。 static。

```
public class Foo
{
    static let shared = Foo()

    // Used for preventing the class from being instantiated directly
    private init() {}

    func doSomething()
    {
        print("Do something")
    }
}
```

```
public class Foo
{
    static let shared = Foo()

    // Used for preventing the class from being instantiated directly
    private init() {}

    func doSomething()
    {
        print("Do something")
    }
}
```

private

- Swiftinit。 KrakenDev

  。

```
protocol SenderProtocol
{
    func send(package: AnyObject)
}

class Fedex: SenderProtocol
{
    func send(package: AnyObject)
    {
```

```
        print("Fedex deliver")
    }
}

class RegularPriorityMail: SenderProtocol
{
    func send(package: AnyObject)
    {
        print("Regular Priority Mail deliver")
    }
}

// This is our Factory
class DeliverFactory
{
    // It will be responsable for returning the proper instance that will handle the task
    static func makeSender(isLate isLate: Bool) -> SenderProtocol
    {
        return isLate ? Fedex() : RegularPriorityMail()
    }
}

// Usage:
let package = ["Item 1", "Item 2"]

// Fedex class will handle the delivery
DeliverFactory.makeSender(isLate:true).send(package)

// Regular Priority Mail class will handle the delivery
DeliverFactory.makeSender(isLate:false).send(package)
```

sender()。

send()。 。

。

。 。 Observer - - MVC。

。

Notification Center

```
let notifCentre = NotificationCenter.default
```

。 ...

```
let notifCentre = NotificationCenter.default
```

“readForMyFunc”。 myFunc。

```
let notifCentre = NotificationCenter.default
```

。

```
let notifCentre = NotificationCenter.default
```

```
let notifCentre = NotificationCenter.default
```

```
let notifCentre = NotificationCenter.default
```

commandprocessing。 processing;processing。 processing。

。

processing。

```
protocol PurchasePower {
var allowable : Float { get }
  var role : String { get }
  var successor : PurchasePower? { get set }
}

extension PurchasePower {
  func process(request : PurchaseRequest){
    if request.amount < self.allowable {
      print(self.role + " will approve $ \(request.amount) for \(request.purpose)")
    } else if successor != nil {
      successor?.process(request: request)
    }
  }
}
```

command。

```
protocol PurchasePower {
var allowable : Float { get }
  var role : String { get }
  var successor : PurchasePower? { get set }
}

extension PurchasePower {
  func process(request : PurchaseRequest){
    if request.amount < self.allowable {
      print(self.role + " will approve $ \(request.amount) for \(request.purpose)")
    } else if successor != nil {
      successor?.process(request: request)
    }
  }
}
```

。

```
protocol PurchasePower {
var allowable : Float { get }
  var role : String { get }
  var successor : PurchasePower? { get set }
}
```

```
extension PurchasePower {
  func process(request : PurchaseRequest){
    if request.amount < self.allowable {
      print(self.role + " will approve $ \(request.amount) for \(request.purpose)")
    } else if successor != nil {
      successor?.process(request: request)
    }
  }
}
```

```
protocol PurchasePower {
var allowable : Float { get }
  var role : String { get }
  var successor : PurchasePower? { get set }
}

extension PurchasePower {
  func process(request : PurchaseRequest){
    if request.amount < self.allowable {
      print(self.role + " will approve $ \(request.amount) for \(request.purpose)")
    } else if successor != nil {
      successor?.process(request: request)
    }
  }
}
```

```
protocol PurchasePower {
var allowable : Float { get }
  var role : String { get }
  var successor : PurchasePower? { get set }
}

extension PurchasePower {
  func process(request : PurchaseRequest){
    if request.amount < self.allowable {
      print(self.role + " will approve $ \(request.amount) for \(request.purpose)")
    } else if successor != nil {
      successor?.process(request: request)
    }
  }
}
```

-

```
struct Turtle {
  let name: String
}

struct Turtles {
  let turtles: [Turtle]
}

struct TurtlesIterator: IteratorProtocol {
  private var current = 0
  private let turtles: [Turtle]

  init(turtles: [Turtle]) {
    self.turtles = turtles
```

```
  }

  mutating func next() -> Turtle? {
    defer { current += 1 }
    return turtles.count > current ? turtles[current] : nil
  }
}

extension Turtles: Sequence {
  func makeIterator() -> TurtlesIterator {
    return TurtlesIterator(turtles: turtles)
  }
}
```

```
struct Turtle {
  let name: String
}

struct Turtles {
  let turtles: [Turtle]
}

struct TurtlesIterator: IteratorProtocol {
  private var current = 0
  private let turtles: [Turtle]

  init(turtles: [Turtle]) {
    self.turtles = turtles
  }

  mutating func next() -> Turtle? {
    defer { current += 1 }
    return turtles.count > current ? turtles[current] : nil
  }
}

extension Turtles: Sequence {
  func makeIterator() -> TurtlesIterator {
    return TurtlesIterator(turtles: turtles)
  }
}
```

。 。 。 。

-Wikipedia

。 。

Car Builder。

Car

- 。
- 。
- 。
- 。
-

    -
-
-

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}

enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

```
import UIKit

enum CarType {
```

```
    case

    sportage,
    saloon
}

enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

。

。

CarBuilder

```
import UIKit

enum CarType {
    case
```

```
    sportage,
    saloon
}

enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

`CarBuilder`car。

`CarBuilder`

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}
```

```
enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

Builder Pattern。

。

CarBluePrint

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}
```

```
enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

;/。

“”

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}

enum GearType {
    case

    manual,
```

```
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

`CarBluePrint`'batteryName'。 `CarBuilderbatteryName`。

`batteryName` new`CarBluePrint` `CarCarBuilder`

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}

enum GearType {
    case

    manual,
    automatic
}

struct Motor {
```

```
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}

class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

CarBuilder

```
import UIKit

enum CarType {
    case

    sportage,
    saloon
}

enum GearType {
    case

    manual,
    automatic
}

struct Motor {
    var id: String
    var name: String
    var model: String
    var numberOfCylinders: UInt8
}
```

```
class Car: CustomStringConvertible {
    var color: UIColor
    var numberOfSeats: UInt8
    var numberOfWheels: UInt8
    var type: CarType
    var gearType: GearType
    var motor: Motor
    var shouldHasAirbags: Bool

    var description: String {
        return "color: \(color)\nNumber of seats: \(numberOfSeats)\nNumber of Wheels:
\(numberOfWheels)\n Type: \(gearType)\nMotor: \(motor)\nAirbag Availability:
\(shouldHasAirbags)"
    }

    init(color: UIColor, numberOfSeats: UInt8, numberOfWheels: UInt8, type: CarType, gearType:
GearType, motor: Motor, shouldHasAirbags: Bool) {

        self.color = color
        self.numberOfSeats = numberOfSeats
        self.numberOfWheels = numberOfWheels
        self.type = type
        self.gearType = gearType
        self.motor = motor
        self.shouldHasAirbags = shouldHasAirbags

    }
}
```

- https://riptutorial.com/zh-TW/swift/topic/4941/---

48: -

。 。

。

Examples

Adaptee Target。 。

Swift。 TargetAdaptee。

```
// The functionality to which a Client has no direct access
class Adaptee {
    func foo() {
        // ...
    }
}

// Target's functionality, to which a Client does have direct access
protocol TargetFunctionality {
    func fooBar() {}
}

// Adapter used to pass the request on the Target to a request on the Adaptee
extension Adaptee: TargetFunctionality {
    func fooBar() {
        foo()
    }
}
```

```
Client -> Target -> Adapter -> Adaptee
```

。 。

Facade。 。

UserDefaultsFacade。

```
enum Defaults {

    static func set(_ object: Any, forKey defaultName: String) {
        let defaults: UserDefaults = UserDefaults.standard
        defaults.set(object, forKey:defaultName)
        defaults.synchronize()
    }

    static func object(forKey key: String) -> AnyObject! {
        let defaults: UserDefaults = UserDefaults.standard
        return defaults.object(forKey: key) as AnyObject!
    }

}
```

。

```
enum Defaults {

    static func set(_ object: Any, forKey defaultName: String) {
        let defaults: UserDefaults = UserDefaults.standard
        defaults.set(object, forKey:defaultName)
        defaults.synchronize()
    }

    static func object(forKey key: String) -> AnyObject! {
        let defaults: UserDefaults = UserDefaults.standard
        return defaults.object(forKey: key) as AnyObject!
    }

}
```

UserDefaults。

- https://riptutorial.com/zh-TW/swift/topic/9497/---

49:

SwiftiBook 。

Examples

var

```
var num: Int = 10
```

```
var num: Int = 10
```

let

```
var num: Int = 10
```

Swift

```
var num: Int = 10
```

- unicode

  Unicode。

  developer.apple.com

```
var num: Int = 10
```

“”。 /

```
class Dog {
    var name = ""
}
```

DognameString 。 Dog

```
class Dog {
    var name = ""
}
```

。

。 。 lazy

```
lazy var veryExpensiveVariable = expensiveMethod()
```

```
lazy var veryExpensiveVariable = expensiveMethod()
```

var。

gettersetter。

```
var pi = 3.14

class Circle {
    var radius = 0.0
    var circumference: Double {
        get {
            return pi * radius * 2
        }
        set {
            radius = newValue / pi / 2
        }
    }
}

let circle = Circle()
circle.radius = 1
print(circle.circumference) // Prints "6.28"
circle.circumference = 14
print(circle.radius) // Prints "2.229..."
```

var

```
var pi = 3.14

class Circle {
    var radius = 0.0
    var circumference: Double {
        get {
            return pi * radius * 2
        }
        set {
            radius = newValue / pi / 2
        }
    }
}

let circle = Circle()
circle.radius = 1
print(circle.circumference) // Prints "6.28"
circle.circumference = 14
print(circle.radius) // Prints "2.229..."
```

get

```
var pi = 3.14

class Circle {
    var radius = 0.0
    var circumference: Double {
        get {
            return pi * radius * 2
```

```
        }
        set {
            radius = newValue / pi / 2
        }
    }
}

let circle = Circle()
circle.radius = 1
print(circle.circumference) // Prints "6.28"
circle.circumference = 14
print(circle.radius) // Prints "2.229..."
```

```
func printSomething() {
    let localString = "I'm local!"
    print(localString)
}

func printSomethingAgain() {
    print(localString) // error
}
```

。

```
func printSomething() {
    let localString = "I'm local!"
    print(localString)
}

func printSomethingAgain() {
    print(localString) // error
}
```

“”。

。 。 `static`type

```
struct Dog {
    static var noise = "Bark!"
}

print(Dog.noise) // Prints "Bark!"
```

`class``static`。

```
struct Dog {
    static var noise = "Bark!"
}

print(Dog.noise) // Prints "Bark!"
```

。

。

```
var myProperty = 5 {
    willSet {
        print("Will set to \(newValue). It was previously \(myProperty)")
    }
    didSet {
        print("Did set to \(myProperty). It was previously \(oldValue)")
    }
}
myProperty = 6
// prints: Will set to 6, It was previously 5
// prints: Did set to 6. It was previously 5
```

- myProperty willSet。 newValue myProperty。
- myProperty didSet。 oldValue myProperty。

  didSetwillSet

  -
  - didSetwillSet

- didSetwillSet oldValuenewValue

```
var myProperty = 5 {
    willSet {
        print("Will set to \(newValue). It was previously \(myProperty)")
    }
    didSet {
        print("Did set to \(myProperty). It was previously \(oldValue)")
    }
}
myProperty = 6
// prints: Will set to 6, It was previously 5
// prints: Did set to 6. It was previously 5
```

setter

- willSet(oldValue)didSet(newValue)。

https://riptutorial.com/zh-TW/swift/topic/536/

50:

“nil”

Apple Inc.“The Swift Programming LanguageSwift 3.1 Edition。”iBooks。
https://itun.es/us/k5SW7.l

letif-letguard-letswitchcase-let coalesce??nil

- var optionalNameoptionalType //nil
- var optionalNameoptionalType = value //
- var optionalNameoptionalType //
- //

Swift 。

Examples

Optionals。 `nil` 。

SwiftApple。 Apple`nil`Objective-CAPI。

Swift`nil`。 a`!?`。 `Int`

```
var numberOne: Int! = nil
var numberTwo: Int? = nil
```

`?`。 `Int` `Int?` nil

```
var numberOne: Int! = nil
var numberTwo: Int? = nil
```

`!`。 `UIButton!viewDidLoad()`

```
var numberOne: Int! = nil
var numberTwo: Int? = nil
```

Optional。

Optional`!` Optional `!`。

“”“”。

`nil`*nil* `!`。

```
var text: String? = nil
```

```
var unwrapped: String = text! //crashes with "unexpectedly found nil while unwrapping an
Optional value"
```

`if-letnil`

```
var text: String? = nil
var unwrapped: String = text! //crashes with "unexpectedly found nil while unwrapping an
Optional value"
```

```
var text: String? = nil
var unwrapped: String = text! //crashes with "unexpectedly found nil while unwrapping an
Optional value"
```

`unwrappedNumberif-letguard`◦

```
var text: String? = nil
var unwrapped: String = text! //crashes with "unexpectedly found nil while unwrapping an
Optional value"
```

◦

◦ if - else

```
var text: String? = nil
var unwrapped: String = text! //crashes with "unexpectedly found nil while unwrapping an
Optional value"
```

nil coalescing

```
func fallbackIfNil(str: String?) -> String {
    return str ?? "Fallback String"
}
print(fallbackIfNil("Hi")) // Prints "Hi"
print(fallbackIfNil(nil)) // Prints "Fallback String"
```

nil

```
func fallbackIfNil(str: String?) -> String {
    return str ?? "Fallback String"
}
print(fallbackIfNil("Hi")) // Prints "Hi"
print(fallbackIfNil(nil)) // Prints "Fallback String"
```

`foo`nil`someExpensiveComputation()` ◦

nil

```
func fallbackIfNil(str: String?) -> String {
    return str ?? "Fallback String"
}
print(fallbackIfNil("Hi")) // Prints "Hi"
```

```
print(fallbackIfNil(nil)) // Prints "Fallback String"
```

bazfoobar。

Optional Chaining 。 ?。

```
struct Foo {
    func doSomething() {
        print("Hello World!")
    }
}

var foo : Foo? = Foo()

foo?.doSomething() // prints "Hello World!" as foo is non-nil
```

foodoSomething() 。 foonil - 。

```
struct Foo {
    func doSomething() {
        print("Hello World!")
    }
}

var foo : Foo? = Foo()

foo?.doSomething() // prints "Hello World!" as foo is non-nil
```

Objective-Cnil

“”“”/。 。

```
struct Foo {
    func doSomething() {
        print("Hello World!")
    }
}

var foo : Foo? = Foo()

foo?.doSomething() // prints "Hello World!" as foo is non-nil
```

foo?.barInt?barfoo。

VoidVoid?。 。

```
struct Foo {
    func doSomething() {
        print("Hello World!")
    }
}

var foo : Foo? = Foo()
```

```
foo?.doSomething() // prints "Hello World!" as foo is non-nil
```

Void?nilfoonil。

-

。 Cnull。 。 -1。 “”。

Swift。

```
var possiblyInt: Int?
```

。

nil。

```
var possiblyInt: Int?
```

nil

```
var possiblyInt: Int?
```

!print。

;。

Int。

```
var possiblyInt: Int?
```

Swift Int。 nil 。

```
var possiblyInt: Int?
```

https://riptutorial.com/zh-TW/swift/topic/247/

51:

Swift 。

Examples

Swift

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

ErrorType NSError。

2.0 2.2

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

3.0

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

`do` / `catch` `throw` `try` 。

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

`do` / `catch`

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

`try` `try?` `try!`

```
func reticulateSplines()                // no return value and no error
func reticulateSplines() -> Int         // always returns a value
func reticulateSplines() throws         // no return value, but may throw an error
func reticulateSplines() throws -> Int  // may either return a value or throw an error
```

。

2.2

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}

func throwing() throws {
    throw CustomError.SomeError
}
```

3.0

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}

func throwing() throws {
    throw CustomError.SomeError
}
```

Do-Catch`catcherror`

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}

func throwing() throws {
    throw CustomError.SomeError
}
```

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}

func throwing() throws {
    throw CustomError.SomeError
}
```

`catch`。 Do。

Do-Catch`CustomError` `NSError` 。

2.2

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}
```

```
func throwing() throws {
    throw CustomError.SomeError
}
```

3.0

Swift 3NSError。

```
enum CustomError: ErrorType {
    case SomeError
    case AnotherError
}

func throwing() throws {
    throw CustomError.SomeError
}
```

```
class Plane {

    enum Emergency: ErrorType {
        case NoFuel
        case EngineFailure(reason: String)
        case DamagedWing
    }

    var fuelInKilograms: Int

    //... init and other methods not shown

    func fly() throws {
        // ...
        if fuelInKilograms <= 0 {
            // uh oh...
            throw Emergency.NoFuel
        }
    }

}
```

```
class Plane {

    enum Emergency: ErrorType {
        case NoFuel
        case EngineFailure(reason: String)
        case DamagedWing
    }

    var fuelInKilograms: Int

    //... init and other methods not shown

    func fly() throws {
        // ...
        if fuelInKilograms <= 0 {
            // uh oh...
            throw Emergency.NoFuel
        }
    }
```

```
}
```

Swift。try。 try。 。

loadImageatPath :)。 。

```
let photo = try! loadImage(atPath: "./Resources/John Appleseed.jpg")
```

enum

```
enum RegistrationError: Error {
    case invalidEmail
    case invalidPassword
    case invalidPhoneNumber
}
```

RegistrationError extension。

```
enum RegistrationError: Error {
    case invalidEmail
    case invalidPassword
    case invalidPhoneNumber
}
```

```
enum RegistrationError: Error {
    case invalidEmail
    case invalidPassword
    case invalidPhoneNumber
}
```

https://riptutorial.com/zh-TW/swift/topic/283/

52:

◦ default case◦ ◦

Swift◦

Examples

```
let number = 3
switch number {
case 1:
    print("One!")
case 2:
    print("Two!")
case 3:
    print("Three!")
default:
    print("Not One, Two or Three")
}
```

switch◦ ◦

```
let number = 3
switch number {
case 1:
    print("One!")
case 2:
    print("Two!")
case 3:
    print("Three!")
default:
    print("Not One, Two or Three")
}
```

```
let number = 3
switch number {
case 1:
    print("One!")
case 2:
    print("Two!")
case 3:
    print("Three!")
default:
    print("Not One, Two or Three")
}
```

switchcase◦

```
let number = 3
```

```
switch number {
case 1, 2:
    print("One or Two!")
case 3:
    print("Three!")
case 4, 5, 6:
    print("Four, Five or Six!")
default:
    print("Not One, Two, Three, Four, Five or Six")
}
```

switchcase。

```
let number = 20
switch number {
case 0:
    print("Zero")
case 1..<10:
    print("Between One and Ten")
case 10..<20:
    print("Between Ten and Twenty")
case 20..<30:
    print("Between Twenty and Thirty")
default:
    print("Greater than Thirty or less than Zero")
}
```

where

whereswitch case。

```
switch (temperature) {
      case 0...49 where temperature % 2 == 0:
        print("Cold and even")

      case 50...79 where temperature % 2 == 0:
        print("Warm and even")

      case 80...110 where temperature % 2 == 0:
        print("Hot and even")

      default:
        print("Temperature out of range or odd")
}
```

```
var str: String? = "hi"
var x: Int? = 5

switch (str, x) {
case (.Some,.Some):
    print("Both have values")
case (.Some, nil):
    print("String has a value")
case (nil, .Some):
    print("Int has a value")
case (nil, nil):
```

```
    print("Neither have values")
}
```

Switch。

```
let coordinates: (x: Int, y: Int, z: Int) = (3, 2, 5)

switch (coordinates) {
case (0, 0, 0): // 1
  print("Origin")
case (_, 0, 0): // 2
  print("On the x-axis.")
case (0, _, 0): // 3
  print("On the y-axis.")
case (0, 0, _): // 4
  print("On the z-axis.")
default:        // 5
  print("Somewhere in space")
}
```

1. 0,0,0。 3D。
2. y = 0z = 0x。 x。
3. x = 0z = 0y。 。
4. x = 0y = 0z。 z。
5. 。

。

switch

```
let coordinates: (x: Int, y: Int, z: Int) = (3, 2, 5)

switch (coordinates) {
case (0, 0, 0): // 1
  print("Origin")
case (_, 0, 0): // 2
  print("On the x-axis.")
case (0, _, 0): // 3
  print("On the y-axis.")
case (0, 0, _): // 4
  print("On the z-axis.")
default:        // 5
  print("Somewhere in space")
}
```

let。 。

switch。 - 。 switch。

let-where。

```
let coordinates: (x: Int, y: Int, z: Int) = (3, 2, 5)
```

```
switch (coordinates) {
case (0, 0, 0): // 1
  print("Origin")
case (_, 0, 0): // 2
  print("On the x-axis.")
case (0, _, 0): // 3
  print("On the y-axis.")
case (0, 0, _): // 4
  print("On the z-axis.")
default:        // 5
  print("Somewhere in space")
}
```

“yx”“yx”。

swiftcase。 `fallthrough`。

```
switch(value) {
case 'one':
    // do operation one
    fallthrough
case 'two':
    // do this either independant, or in conjunction with first case
default:
    // default operation
}
```

。

SwitchEnum

```
enum CarModel {
    case Standard, Fast, VeryFast
}

let car = CarModel.Standard

switch car {
case .Standard: print("Standard")
case .Fast: print("Fast")
case .VeryFast: print("VeryFast")
}
```

`default`。

。

```
var result: AnyObject? = someMethod()

switch result {
case nil:
    print("result is nothing")
case is String:
    print("result is a String")
case _ as Double:
```

```
    print("result is not nil, any value that is a Double")
case let myInt as Int where myInt > 0:
    print("\(myInt) value is not nil but an int and greater than 0")
case let a?:
    print("\(a) - value is unwrapped")
}
```

```
public typealias mdyTuple = (month: Int, day: Int, year: Int)

let fredsBirthday =   (month: 4, day: 3, year: 1973)




switch theMDY
{
//You can match on a literal tuple:
case (fredsBirthday):
  message = "\(date) \(prefix) the day Fred was born"

//You can match on some of the terms, and ignore others:
case (3, 15, _):
  message = "Beware the Ides of March"

//You can match on parts of a literal tuple, and copy other elements
//into a constant that you use in the body of the case:
case (bobsBirthday.month, bobsBirthday.day, let year) where year > bobsBirthday.year:
  message = "\(date) \(prefix) Bob's \(possessiveNumber(year - bobsBirthday.year))" +
    "birthday"

//You can copy one or more elements of the tuple into a constant and then
//add a where clause that further qualifies the case:
case (susansBirthday.month, susansBirthday.day, let year)
  where year > susansBirthday.year:
  message = "\(date) \(prefix) Susan's " +
    "\(possessiveNumber(year - susansBirthday.year)) birthday"

//You can match some elements to ranges:.
case (5, 1...15, let year):
  message = "\(date) \(prefix) in the first half of May, \(year)"
}
```

- prepareForSegue

switch。

`prepareForSegue` 。 segue。 segue。 seguessegue。

Swift。

Swift `case let var as Class`

3.0

```
override func prepareForSegue(segue: UIStoryboardSegue, sender: AnyObject?) {
  switch segue.destinationViewController {
    case let fooViewController as FooViewController:
```

```
      fooViewController.delegate = self

    case let barViewController as BarViewController:
      barViewController.data = data

    default:
      break
  }
}
```

3.0

Swift 3sytax

```
override func prepareForSegue(segue: UIStoryboardSegue, sender: AnyObject?) {
  switch segue.destinationViewController {
    case let fooViewController as FooViewController:
      fooViewController.delegate = self

    case let barViewController as BarViewController:
      barViewController.data = data

    default:
      break
  }
}
```

https://riptutorial.com/zh-TW/swift/topic/207/

53: JSON

- NSJSONSerialization.JSONObjectWithDatajsonDataoptionsNSJSONReadingOptions//jsonDataObject。 。
- NSJSONSerialization.dataWithJSONObjectjsonObjectoptionsNSJSONWritingOptions//JSONNSData。 NSJSONWritingOptions.PrettyPrinted。

Examples

Apple FoundationSwiftJSON

JSONSerializationAppleFoundation。

2.2

JSON

`JSONObjectWithDataNSData AnyObject 。 as?。`

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

`options: .AllowFragmentsoptions: []`JSON。

JSON

`dataWithJSONObject`JSON`NSNull`UTF-8`NSData 。`

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])
```

```
    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

options: .PrettyPrintedoptions: []。

3.0

Swift 3。

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

Swift 4.0。

Swift 4.0Swift`EncodableDecodable`。 `EncoderDecoder`JSON。 `Codable``EncodableDecodable`。 JSON。

`Codable`。 `String` `IntDouble`;`Date` `DataURL`。 `Codable`。

`BookCodable`。

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

ArrayDictionaryCodable。

Codable BookApple FoundationJSONEncoderJSONDecoderJSONJSONBookJSON。 EncoderDecoder。

JSON

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

encoder.outputFormatting = .prettyPrinted。 ##JSON

JSON

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

Book.selfJSON。

APIJSONJSONAPI。

JSONEncodable 。

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
```

```
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

JSON`Decodable`。

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

APISwift。 JSONJSON。 `CodingKey`。

```
do {
    guard let jsonData = "[\"Hello\", \"JSON\"]".dataUsingEncoding(NSUTF8StringEncoding) else
{
        fatalError("couldn't encode string as UTF-8")
    }

    // Convert JSON from NSData to AnyObject
    let jsonObject = try NSJSONSerialization.JSONObjectWithData(jsonData, options: [])

    // Try to convert AnyObject to array of strings
    if let stringArray = jsonObject as? [String] {
        print("Got array of strings: \(stringArray.joinWithSeparator(", "))")
    }
} catch {
    print("error reading JSON: \(error)")
}
```

`CodingKeysCodablepublicationDatepublication_date` API。

SwiftyJSON

SwiftyJSONSwiftJSON。

https //github.com/SwiftyJSON/SwiftyJSON

SwiftyJSONJSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

SwiftyJSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

nil。

SwiftyJSONGit - Swift 3。 “SwiftyJSON.swift”

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

JSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
```

```
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

swift

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

SwiftyJSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

JSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

JSON

```
if let jsonObject = try NSJSONSerialization.JSONObjectWithData(data, options: .AllowFragments)
as? [[String: AnyObject]],
let bookName = (jsonObject[0]["book"] as? [String: AnyObject])?["name"] as? String {
    //We can now use the book name
}
```

FreddyBig Nerd RanchJSON。

1. JSON。
2. Swift。
3. JSON。

JSON

JSON。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```


```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
```

```
    ]
  }
}
```

JSON。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```

try json"success" - 。

JSON。 。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
```

```
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```

JSONJSONDecodable。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```

JSONNSData 。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
```

```
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```

JSONEncodableNSData。

```
{
  "success": true,
  "people": [
    {
      "name": "Matt Mathias",
      "age": 32,
      "spouse": true
    },
    {
      "name": "Sergeant Pepper",
      "age": 25,
      "spouse": false
    }
  ],
  "jobs": [
    "teacher",
    "judge"
  ],
  "states": {
    "Georgia": [
      30301,
      30302,
      30303
    ],
    "Wisconsin": [
      53000,
      53001
    ]
  }
}
```

ArrowSwiftJSON。

JSON<--

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

Swift

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

JSON

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

CocoaPods

```
identifier <-- json["id"]
name <-- json["name"]
stats <-- json["stats"]
```

XcodeArrow.swift

https://github.com/s4cha/Arrow

GitHubArrowFramework。 。

JSON

JSON`Todo` as

```
struct Todo {
    let comment: String
}
```

JSON`NSJSONSerializationNSData`。

`JSONDecodable`

```
struct Todo {
    let comment: String
}
```

`TodoJSONDecodable`

```
struct Todo {
    let comment: String
}
```

json

```
struct Todo {
    let comment: String
}
```

API`AnyObject` `JSONDictionary`

```
struct Todo {
    let comment: String
}
```

JSON`Todo`todos

```
struct Todo {
    let comment: String
}
```

`flatMap`Todonil

```
struct Todo {
    let comment: String
}
```

JSONSwift 3

`animals.json`JSON

```
{
    "Sea Animals": [
    {
     "name": "Fish",
     "question": "How many species of fish are there?"    },
                {
                "name": "Sharks",
                "question": "How long do sharks live?"
                },
                {
                "name": "Squid",
                "question": "Do squids have brains?"
                },
```

```
                {
                "name": "Octopus",
                "question": "How big do octopus get?"
                },
                {
                "name": "Star Fish",
                "question": "How long do star fish live?"
                }
                ],
    "mammals": [
                {
      "name": "Dog",
      "question": "How long do dogs live?"
    },
    {
      "name": "Elephant",
      "question": "How much do baby elephants weigh?"
    },
    {
      "name": "Cats",
      "question": "Do cats really have 9 lives?"
    },
    {
      "name": "Tigers",
      "question": "Where do tigers live?"
    },
    {
      "name": "Pandas",
      "question": "WHat do pandas eat?"
    }   ] }
```

JSON

JSON

```
{
    "Sea Animals": [
    {
     "name": "Fish",
     "question": "How many species of fish are there?"    },
                {
                "name": "Sharks",
                "question": "How long do sharks live?"
                },
                {
                "name": "Squid",
                "question": "Do squids have brains?"
                },
                {
                "name": "Octopus",
                "question": "How big do octopus get?"
                },
                {
                "name": "Star Fish",
                "question": "How long do star fish live?"
                }
                ],
    "mammals": [
                {
      "name": "Dog",
```

```
      "question": "How long do dogs live?"
    },
    {
      "name": "Elephant",
      "question": "How much do baby elephants weigh?"
    },
    {
      "name": "Cats",
      "question": "Do cats really have 9 lives?"
    },
    {
      "name": "Tigers",
      "question": "Where do tigers live?"
    },
    {
      "name": "Pandas",
      "question": "WHat do pandas eat?"
    }   ] }
```

NSObject。

`ParsingObject`swift。

JSON

- swift`namequestion`

```
{
    "Sea Animals": [
    {
     "name": "Fish",
     "question": "How many species of fish are there?"    },
                {
                "name": "Sharks",
                "question": "How long do sharks live?"
                },
                {
                "name": "Squid",
                "question": "Do squids have brains?"
                },
                {
                "name": "Octopus",
                "question": "How big do octopus get?"
                },
                {
                "name": "Star Fish",
                "question": "How long do star fish live?"
                }
                ],
    "mammals": [
                {
      "name": "Dog",
      "question": "How long do dogs live?"
    },
    {
      "name": "Elephant",
      "question": "How much do baby elephants weigh?"
    },
    {
```

```
      "name": "Cats",
      "question": "Do cats really have 9 lives?"
    },
    {
      "name": "Tigers",
      "question": "Where do tigers live?"
    },
    {
      "name": "Pandas",
      "question": "WHat do pandas eat?"
    }   ] }
```

NSObjectViewController.swift var array = ParsingObject。

```
{
    "Sea Animals": [
    {
     "name": "Fish",
     "question": "How many species of fish are there?"    },
                {
                "name": "Sharks",
                "question": "How long do sharks live?"
                },
                {
                "name": "Squid",
                "question": "Do squids have brains?"
                },
                {
                "name": "Octopus",
                "question": "How big do octopus get?"
                },
                {
                "name": "Star Fish",
                "question": "How long do star fish live?"
                }
                ],
    "mammals": [
                {
      "name": "Dog",
      "question": "How long do dogs live?"
    },
    {
      "name": "Elephant",
      "question": "How much do baby elephants weigh?"
    },
    {
      "name": "Cats",
      "question": "Do cats really have 9 lives?"
    },
    {
      "name": "Tigers",
      "question": "Where do tigers live?"
    },
    {
      "name": "Pandas",
      "question": "WHat do pandas eat?"
    }   ] }
```

tableview

```
{
    "Sea Animals": [
    {
     "name": "Fish",
     "question": "How many species of fish are there?"    },
                {
                "name": "Sharks",
                "question": "How long do sharks live?"
                },
                {
                "name": "Squid",
                "question": "Do squids have brains?"
                },
                {
                "name": "Octopus",
                "question": "How big do octopus get?"
                },
                {
                "name": "Star Fish",
                "question": "How long do star fish live?"
                }
                ],
    "mammals": [
                {
      "name": "Dog",
      "question": "How long do dogs live?"
    },
    {
      "name": "Elephant",
      "question": "How much do baby elephants weigh?"
    },
    {
      "name": "Cats",
      "question": "Do cats really have 9 lives?"
    },
    {
      "name": "Tigers",
      "question": "Where do tigers live?"
    },
    {
      "name": "Pandas",
      "question": "WHat do pandas eat?"
    }   ] }
```

JSON https://riptutorial.com/zh-TW/swift/topic/223/json

54:

- var closureVar<parameters> - ><returnType>//
- typealias ClosureType =<parameters> - ><returnType>
- <statement{[<captureList>]<parameters><throws-ness> - > <returnType>} //

SwiftApple 。

Examples

lambdas 。

```
let sayHi = { print("Hello") }
// The type of sayHi is "() -> ()", aka "() -> Void"

sayHi()  // prints "Hello"
```

```
let sayHi = { print("Hello") }
// The type of sayHi is "() -> ()", aka "() -> Void"

sayHi()  // prints "Hello"
```

```
let sayHi = { print("Hello") }
// The type of sayHi is "() -> ()", aka "() -> Void"

sayHi()  // prints "Hello"
```

```
let sayHi = { print("Hello") }
// The type of sayHi is "() -> ()", aka "() -> Void"

sayHi()  // prints "Hello"
```

`{` `[` *capture list* `]` `(` `)` *throws-ness* `->` *body* `in` *body* `}` 。

```
let addOne = { [] (x: Int) -> Int in return x + 1 }
let addOne = { [] (x: Int) -> Int in x + 1 }
let addOne = { (x: Int) -> Int in x + 1 }
let addOne = { x -> Int in x + 1 }
let addOne = { x in x + 1 }
let addOne = { $0 + 1 }

let addOneOrThrow = { [] (x: Int) throws -> Int in return x + 1 }
let addOneOrThrow = { [] (x: Int) throws -> Int in x + 1 }
let addOneOrThrow = { (x: Int) throws -> Int in x + 1 }
let addOneOrThrow = { x throws -> Int in x + 1 }
let addOneOrThrow = { x throws in x + 1 }
```

- 。
- 。
-

。

- ;$0 $1 $2。
- return。
- throws 。

```
let addOne = { [] (x: Int) -> Int in return x + 1 }
let addOne = { [] (x: Int) -> Int in x + 1 }
let addOne = { (x: Int) -> Int in x + 1 }
let addOne = { x -> Int in x + 1 }
let addOne = { x in x + 1 }
let addOne = { $0 + 1 }

let addOneOrThrow = { [] (x: Int) throws -> Int in return x + 1 }
let addOneOrThrow = { [] (x: Int) throws -> Int in x + 1 }
let addOneOrThrow = { (x: Int) throws -> Int in x + 1 }
let addOneOrThrow = { x throws -> Int in x + 1 }
let addOneOrThrow = { x throws in x + 1 }
```

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

{ / }

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

()

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

@noescape

@noescapeself.

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

3

Swift 3@noescape。 。 Swift 3“@escaping”。

---

throwsrethrows

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

throw

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

rethrows

```
func foo(value: Double, block: () -> Void) { ... }
func foo(value: Double, block: Int -> Int) { ... }
func foo(value: Double, block: (Int, Int) -> String) { ... }
```

`rethrows` `map()` `filter()``indexOf()` 。

/

```
class MyClass {
    func sayHi() { print("Hello") }
    deinit { print("Goodbye") }
}
```

```
class MyClass {
    func sayHi() { print("Hello") }
    deinit { print("Goodbye") }
}
```

```
class MyClass {
    func sayHi() { print("Hello") }
    deinit { print("Goodbye") }
}
```

```
class MyClass {
    func sayHi() { print("Hello") }
    deinit { print("Goodbye") }
}
```

“ ”“Swift”“ ”。

。 。

```
class MyClass {
    func sayHi() { print("Hello") }
    deinit { print("Goodbye") }
}
```

。

3.0

```
func getData(urlString: String, callback: (result: NSData?) -> Void) {

    // Turn the URL string into an NSURLRequest.
    guard let url = NSURL(string: urlString) else { return }
    let request = NSURLRequest(URL: url)

    // Asynchronously fetch data from the given URL.
    let task = NSURLSession.sharedSession().dataTaskWithRequest(request) {(data: NSData?,
response: NSURLResponse?, error: NSError?) in

        // We now have the NSData response from the website.
        // We can get it "out" of the function by using the callback
        // that was passed to this function as a parameter.

        callback(result: data)
    }

    task.resume()
}
```

GUI。

3.0

```
func getData(urlString: String, callback: (result: NSData?) -> Void) {

    // Turn the URL string into an NSURLRequest.
    guard let url = NSURL(string: urlString) else { return }
    let request = NSURLRequest(URL: url)

    // Asynchronously fetch data from the given URL.
    let task = NSURLSession.sharedSession().dataTaskWithRequest(request) {(data: NSData?,
response: NSURLResponse?, error: NSError?) in

        // We now have the NSData response from the website.
        // We can get it "out" of the function by using the callback
        // that was passed to this function as a parameter.

        callback(result: data)
    }

    task.resume()
```

```
}
```

```
func getData(urlString: String, callback: (result: NSData?) -> Void) {

    // Turn the URL string into an NSURLRequest.
    guard let url = NSURL(string: urlString) else { return }
    let request = NSURLRequest(URL: url)

    // Asynchronously fetch data from the given URL.
    let task = NSURLSession.sharedSession().dataTaskWithRequest(request) {(data: NSData?,
response: NSURLResponse?, error: NSError?) in

        // We now have the NSData response from the website.
        // We can get it "out" of the function by using the callback
        // that was passed to this function as a parameter.

        callback(result: data)
    }

    task.resume()
}
```

URL`print("2. Fetched data")` 。

`typealias`。 。 “”。

```
public typealias ClosureType = (x: Int, y: Int) -> Int
```

typealias

```
public typealias ClosureType = (x: Int, y: Int) -> Int
```

https://riptutorial.com/zh-TW/swift/topic/262/

55:

Examples

。 。

```
var colors = Set<String>()
```

。

```
var colors = Set<String>()
```

```
var favoriteColors: Set = ["Red", "Blue", "Green"]
//favoriteColors = {"Blue", "Green", "Red"}
```

`insert(_:)`。

```
var favoriteColors: Set = ["Red", "Blue", "Green"]
//favoriteColors = {"Blue", "Green", "Red"}
```

`remove(_:)`。 nil。

```
var favoriteColors: Set = ["Red", "Blue", "Green"]
//favoriteColors = {"Blue", "Green", "Red"}
```

```
var favoriteColors: Set = ["Red", "Blue", "Green"]
//favoriteColors = {"Blue", "Green", "Red"}
```

`contains(_:)`。 true。

```
var favoriteColors: Set = ["Red", "Blue", "Green"]
//favoriteColors = {"Blue", "Green", "Red"}
```

`intersect(_:)`。

```
let favoriteColors: Set = ["Red", "Blue", "Green"]
let newColors: Set = ["Purple", "Orange", "Green"]

let intersect = favoriteColors.intersect(newColors) // a AND b
// intersect = {"Green"}
```

`union(_:)`。

```
let favoriteColors: Set = ["Red", "Blue", "Green"]
let newColors: Set = ["Purple", "Orange", "Green"]
```

```
let intersect = favoriteColors.intersect(newColors) // a AND b
// intersect = {"Green"}
```

“”。

`exclusiveOr(_:)`。

```
let favoriteColors: Set = ["Red", "Blue", "Green"]
let newColors: Set = ["Purple", "Orange", "Green"]

let intersect = favoriteColors.intersect(newColors) // a AND b
// intersect = {"Green"}
```

“Green”。

`subtract(_:)`。

```
let favoriteColors: Set = ["Red", "Blue", "Green"]
let newColors: Set = ["Purple", "Orange", "Green"]

let intersect = favoriteColors.intersect(newColors) // a AND b
// intersect = {"Green"}
```

“”。

Set

`Set Hashable`

```
struct Starship: Hashable {
    let name: String
    var hashValue: Int { return name.hashValue }
}

func ==(left:Starship, right: Starship) -> Bool {
    return left.name == right.name
}
```

`Set Starship(s)`

```
struct Starship: Hashable {
    let name: String
    var hashValue: Int { return name.hashValue }
}

func ==(left:Starship, right: Starship) -> Bool {
    return left.name == right.name
}
```

CountedSet

3.0

Swift 3`CountedSet``NSCountedSet` Objective-CSwift。

CountedSet。

```
let countedSet = CountedSet()
countedSet.add(1)
countedSet.add(1)
countedSet.add(1)
countedSet.add(2)

countedSet.count(for: 1) // 3
countedSet.count(for: 2) // 1
```

https://riptutorial.com/zh-TW/swift/topic/371/

56:

SwiftWWDC 2015 。

Swift 2 。

Examples

。

ViewModelUIViewController。

1. ViewModelUIViewController。
2. ViewModel。
3. 。

```
protocol ViewModelType {
   var title : String {get}
   func confirm()
}

class ViewModel : ViewModelType {
   let title : String

   init(title: String) {
       self.title = title
   }
   func confirm() { ... }
}

class ViewController : UIViewController {
   // We declare the viewModel property as an object conforming to the protocol
   // so we can swap the implementations without any friction.
   var viewModel : ViewModelType!
   @IBOutlet var titleLabel : UILabel!

   override func viewDidLoad() {
       super.viewDidLoad()
       titleLabel.text = viewModel.title
   }

   @IBAction func didTapOnButton(sender: UIButton) {
       viewModel.confirm()
   }
}

// With DI we setup the view controller and assign the view model.
// The view controller doesn't know the concrete class of the view model,
// but just relies on the declared interface on the protocol.
let viewController = //... Instantiate view controller
viewController.viewModel = ViewModel(title: "MyTitle")
```

1. ViewModel
2.

UIViewController。

3.

```
protocol ViewModelType {
   var title : String {get}
   func confirm()
}

class ViewModel : ViewModelType {
   let title : String

   init(title: String) {
       self.title = title
   }
   func confirm() { ... }
}

class ViewController : UIViewController {
   // We declare the viewModel property as an object conforming to the protocol
   // so we can swap the implementations without any friction.
   var viewModel : ViewModelType!
   @IBOutlet var titleLabel : UILabel!

   override func viewDidLoad() {
       super.viewDidLoad()
       titleLabel.text = viewModel.title
   }

   @IBAction func didTapOnButton(sender: UIButton) {
       viewModel.confirm()
   }
}

// With DI we setup the view controller and assign the view model.
// The view controller doesn't know the concrete class of the view model,
// but just relies on the declared interface on the protocol.
let viewController = //... Instantiate view controller
viewController.viewModel = ViewModel(title: "MyTitle")
```

Swift。

。

/。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
```

```
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

get。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

ItemData。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
```

```
}
```

item。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

get。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

。 。 APICore Data。

```
protocol ItemData {

    var title: String { get }
```

```
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

Core DataDisplayItem。

```
protocol ItemData {

    var title: String { get }
    var description: String { get }
    var thumbnailURL: NSURL { get }
    var created: NSDate { get }
    var updated: NSDate { get }

}

protocol DisplayItem {

    func hasBeenUpdated() -> Bool
    func getFormattedTitle() -> String
    func getFormattedDescription() -> String

}

protocol GetAPIItemDataOperation {

    static func get(url: NSURL, completed: ([ItemData]) -> Void)
}
```

https://riptutorial.com/zh-TW/swift/topic/2502/

57:

init()。

Examples

```
class Dog {}
```

```
class Dog {}
```

AnimalDog。

。

```
class Dog {
    var name = ""
}

let firstDog = Dog()
firstDog.name = "Fido"

let otherDog = firstDog  // otherDog points to the same Dog instance
otherDog.name = "Rover"  // modifying otherDog also modifies firstDog

print(firstDog.name)  // prints "Rover"
```

。

```
class Dog {
    var name = ""
}

let firstDog = Dog()
firstDog.name = "Fido"

let otherDog = firstDog  // otherDog points to the same Dog instance
otherDog.name = "Rover"  // modifying otherDog also modifies firstDog

print(firstDog.name)  // prints "Rover"
```

===

```
class Dog {
    var name = ""
}

let firstDog = Dog()
firstDog.name = "Fido"

let otherDog = firstDog  // otherDog points to the same Dog instance
otherDog.name = "Rover"  // modifying otherDog also modifies firstDog
```

```
print(firstDog.name)  // prints "Rover"
```

- Dog namedogYearAge

```
class Dog {
    var name = ""
    var dogYearAge = 0
}
```

```
class Dog {
    var name = ""
    var dogYearAge = 0
}
```

```
class Dog {
    var name = ""
    var dogYearAge = 0
}
```

```
class Dog {
    var name = ""
    var dogYearAge = 0
}
```

Swift。 。

```
class Animal { ... }
class Pet { ... }

class Dog: Animal, Pet { ... } // This will result in a compiler error.
```

。 。

DEINIT

```
class ClassA {

    var timer: NSTimer!

    init() {
        // initialize timer
    }

    deinit {
        // code
        timer.invalidate()
    }
}
```

https://riptutorial.com/zh-TW/swift/topic/459/

58:

- `let name = json["name"] as? String ?? ""` //
- `let name = json["name"] as? String // Output: Optional("john")`
- `let name = rank as? Int // Output: Optional(1)`
- `let name = rank as? Int ?? 0 // Output: 1`
- `let name = dictionary as? [String: Any] ?? [:] // Output: ["name" : "john", "subjects": ["Maths", "Science", "English", "C Language"]]`

Examples

as? as! ◦

as?◦

◦

```
let value: Any = "John"

let name = value as? String
print(name) // prints Optional("John")

let age = value as? Double
print(age) // prints nil
```

as!◦

◦

```
let value: Any = "John"

let name = value as? String
print(name) // prints Optional("John")

let age = value as? Double
print(age) // prints nil
```

```
let value: Any = "John"

let name = value as? String
print(name) // prints Optional("John")

let age = value as? Double
print(age) // prints nil
```

switch

```
func checkType(_ value: Any) -> String {
    switch value {
```

```
    // The `is` operator can be used to check a type
    case is Double:
        return "value is a Double"

    // The `as` operator will cast. You do not need to use `as?` in a `switch`.
    case let string as String:
        return "value is the string: \(string)"

    default:
        return "value is something else"
    }

}

checkType("Cadena")  // "value is the string: Cadena"
checkType(6.28)      // "value is a Double"
checkType(UILabel()) // "value is something else"
```

as。 。

```
let name = "Ringo"
let value = string as Any  // `value` is of type `Any` now
```

。

```
class Rat {
    var color = "white"
}

class PetRat: Rat {
    var name = "Spot"
}

func nameOfRat(□: Rat) -> String {
    guard let petRat = (□ as? PetRat) else {
        return "No name"
    }

    return petRat.name
}

let noName = Rat()
let spot = PetRat()

print(nameOfRat(noName))
print(nameOfRat(spot))
```

Swift

。

Swiftisas。 。

- as
- - -
- nil
- -

IntFloat -

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
```

```
print(floatValue) // Output : 888.0
```

String

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

StringInt

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

JSON

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

Optional JSON

```
let numbers = "888.00"
let intValue = NSString(string: numbers).integerValue
print(intValue) // Output - 888


let numbers = "888.00"
let floatValue = NSString(string: numbers).floatValue
print(floatValue) // Output : 888.0
```

JSON

```
    let numbers = "888.00"
    let intValue = NSString(string: numbers).integerValue
    print(intValue) // Output - 888


    let numbers = "888.00"
    let floatValue = NSString(string: numbers).floatValue
    print(floatValue) // Output : 888.0
```

```
    let numbers = "888.00"
    let intValue = NSString(string: numbers).integerValue
    print(intValue) // Output - 888


    let numbers = "888.00"
    let floatValue = NSString(string: numbers).floatValue
    print(floatValue) // Output : 888.0
```

Empty Dictionary

https://riptutorial.com/zh-TW/swift/topic/3082/

59:

Swift Swift.org API 。 The Official raywenderlich.com Swift Style Guide。

Examples

。

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

。 `list.remove(42)` 42Element42Element。

。

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

`list.removeElement(someObject)` 。 `someObject`。

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

`list.remove(someObject)` 。

。

Iterator“Type”。 IteratorType

。

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

`object.addObserverselfforKeyPathpath

```
extension List {
    public mutating func remove(at position: Index) -> Element {
        // implementation
    }
}
```

```
object.add(self, for: path)
```

。

```
list.insert(element, at: index)
```

```
list.insert(element, at: index)
```

`make`。

```
list.insert(element, at: index)
```

。

```
list.insert(element, at: index)
```

```
list.insert(element, at: index)
```

- form-。
- -ing-ed。

```
list.insert(element, at: index)
```

```
list.insert(element, at: index)
```

。

```
list.insert(element, at: index)
```

- 。
- -able -ible-ing。

```
list.insert(element, at: index)
```

。

```
list.insert(element, at: index)
```

。

```
protocol Collection {}
struct String {}
class UIView {}
struct Int {}
enum Color {}
```

。

```
protocol Collection {}
struct String {}
class UIView {}
struct Int {}
enum Color {}
```

。 /。

```
protocol Collection {}
struct String {}
class UIView {}
```

```
struct Int {}
enum Color {}
```

```
protocol Collection {}
struct String {}
class UIView {}
struct Int {}
enum Color {}
```

URLID。 。

```
protocol Collection {}
struct String {}
class UIView {}
struct Int {}
enum Color {}
```

https://riptutorial.com/zh-TW/swift/topic/3031/

60:

Examples

Swift。 `operatoroperator` 。

。

1. `prefix` `infixpostfix`。 `prefixpostfix`。 urnary`83++` ** 。 `infix2+3` 。
2. 。 `?` ... `:` Swift 2.x100。 Swift。
3. 。 。

3.0

Swift 3.0。 。

。 `return`。

Swift。

```
import Foundation

infix operator ** { associativity left precedence 170 }

func ** (num: Double, power: Double) -> Double{
    return pow(num, power)
}
```

`infix**9**2` 。 `3**3**2(3**3)**2` 。 `170`Swift`3+2**419 **`。

3.0

```
import Foundation

infix operator ** { associativity left precedence 170 }

func ** (num: Double, power: Double) -> Double{
    return pow(num, power)
}
```

Swift 3.0BitwiseShiftPrecedence`<<` `>>`。

**Swift 3。

+

Swift `++=`。

```
// Combines two dictionaries together. If both dictionaries contain
// the same key, the value of the right hand side dictionary is used.
func +<K, V>(lhs: [K : V], rhs: [K : V]) -> [K : V] {
    var combined = lhs
    for (key, value) in rhs {
        combined[key] = value
    }
    return combined
}

// The mutable variant of the + overload, allowing a dictionary
// to be appended to 'in-place'.
func +=<K, V>(inout lhs: [K : V], rhs: [K : V]) {
    for (key, value) in rhs {
        lhs[key] = value
    }
}
```

3.0

Swift 3 `inout`。

```
// Combines two dictionaries together. If both dictionaries contain
// the same key, the value of the right hand side dictionary is used.
func +<K, V>(lhs: [K : V], rhs: [K : V]) -> [K : V] {
    var combined = lhs
    for (key, value) in rhs {
        combined[key] = value
    }
    return combined
}

// The mutable variant of the + overload, allowing a dictionary
// to be appended to 'in-place'.
func +=<K, V>(inout lhs: [K : V], rhs: [K : V]) {
    for (key, value) in rhs {
        lhs[key] = value
    }
}
```

```
// Combines two dictionaries together. If both dictionaries contain
// the same key, the value of the right hand side dictionary is used.
func +<K, V>(lhs: [K : V], rhs: [K : V]) -> [K : V] {
    var combined = lhs
    for (key, value) in rhs {
        combined[key] = value
    }
    return combined
}

// The mutable variant of the + overload, allowing a dictionary
// to be appended to 'in-place'.
func +=<K, V>(inout lhs: [K : V], rhs: [K : V]) {
    for (key, value) in rhs {
        lhs[key] = value
    }
}
```

CGSize

```
func *(lhs: CGFloat, rhs: CGSize) -> CGSize{
    let height = lhs*rhs.height
    let width = lhs*rhs.width
    return CGSize(width: width, height: height)
}
```

```
func *(lhs: CGFloat, rhs: CGSize) -> CGSize{
    let height = lhs*rhs.height
    let width = lhs*rhs.width
    return CGSize(width: width, height: height)
}
```

```
func *(lhs: CGFloat, rhs: CGSize) -> CGSize{
    let height = lhs*rhs.height
    let width = lhs*rhs.width
    return CGSize(width: width, height: height)
}
```

```
func *(lhs: CGFloat, rhs: CGSize) -> CGSize{
    let height = lhs*rhs.height
    let width = lhs*rhs.width
    return CGSize(width: width, height: height)
}
```

。

```
func *(lhs: CGFloat, rhs: CGSize) -> CGSize{
    let height = lhs*rhs.height
    let width = lhs*rhs.width
    return CGSize(width: width, height: height)
}
```

Swift Bitwise。 `0b0b110`1106。 10。

NOT `~`

```
var number: UInt8 = 0b01101100
let newNumber = ~number
// newNumber is equal to 0b01101100
```

。 `UInt8`8。 `0b01101100`UInt01

```
var number: UInt8 = 0b01101100
let newNumber = ~number
// newNumber is equal to 0b01101100
```

- 0 - > 1
- 1 - > 0

AND `&`

```
var number: UInt8 = 0b01101100
let newNumber = ~number
// newNumber is equal to 0b01101100
```

&11。

- 00 - > 0
- 01 - > 0
- 11 - > 1

OR |

```
var number: UInt8 = 0b01101100
let newNumber = ~number
// newNumber is equal to 0b01101100
```

|11。

- 0 | 0 - > 0
- 0 | 1 - > 1
- 1 | 1 - > 1

^

```
var number: UInt8 = 0b01101100
let newNumber = ~number
// newNumber is equal to 0b01101100
```

1。

- 0 ^ 0 - > 0
- 0 ^ 1 - > 1
- 1 ^ 1 - > 0

。

。

。 。

Swift+ -*。 &+ &-&*。

```
var almostTooLarge = Int.max
almostTooLarge + 1 // not allowed
almostTooLarge &+ 1 // allowed, but result will be the value of Int.min
```

Swift

。

	≥3.0		
`.`		∞	
`? ! ++ -- [] () {}`			
`! ~ + - ++ --`			
~> swift≤2.3		255	
`<< >>`	BitwiseShiftPrecedence	160	
`* / % & &*`	MultiplicationPrecedence	150	
`+ - | ^ &+ &-`	AdditionPrecedence	140	
`... ..<`	RangeFormationPrecedence	135	
`is as as? as!`	CastingPrecedence	132	
`??`	NilCoalescingPrecedence	131	
`< <= > >= == != === !== ~=`	ComparisonPrecedence	130	
`&&`	LogicalConjunctionPrecedence	120	
`||`	LogicalDisjunctionPrecedence	110	
	DefaultPrecedence *		
`? ..... :`	TernaryPrecedence	100	
`= += -= *= /= %= <<= >>= &= |= ^=`	AssignmentPrecedence	90	
`->`	FunctionArrowPrecedence		

3.0

- `DefaultPrecedenceTernaryPrecedence` ◦ ◦

- AppleAPI
- GitHub

https://riptutorial.com/zh-TW/swift/topic/1048/

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