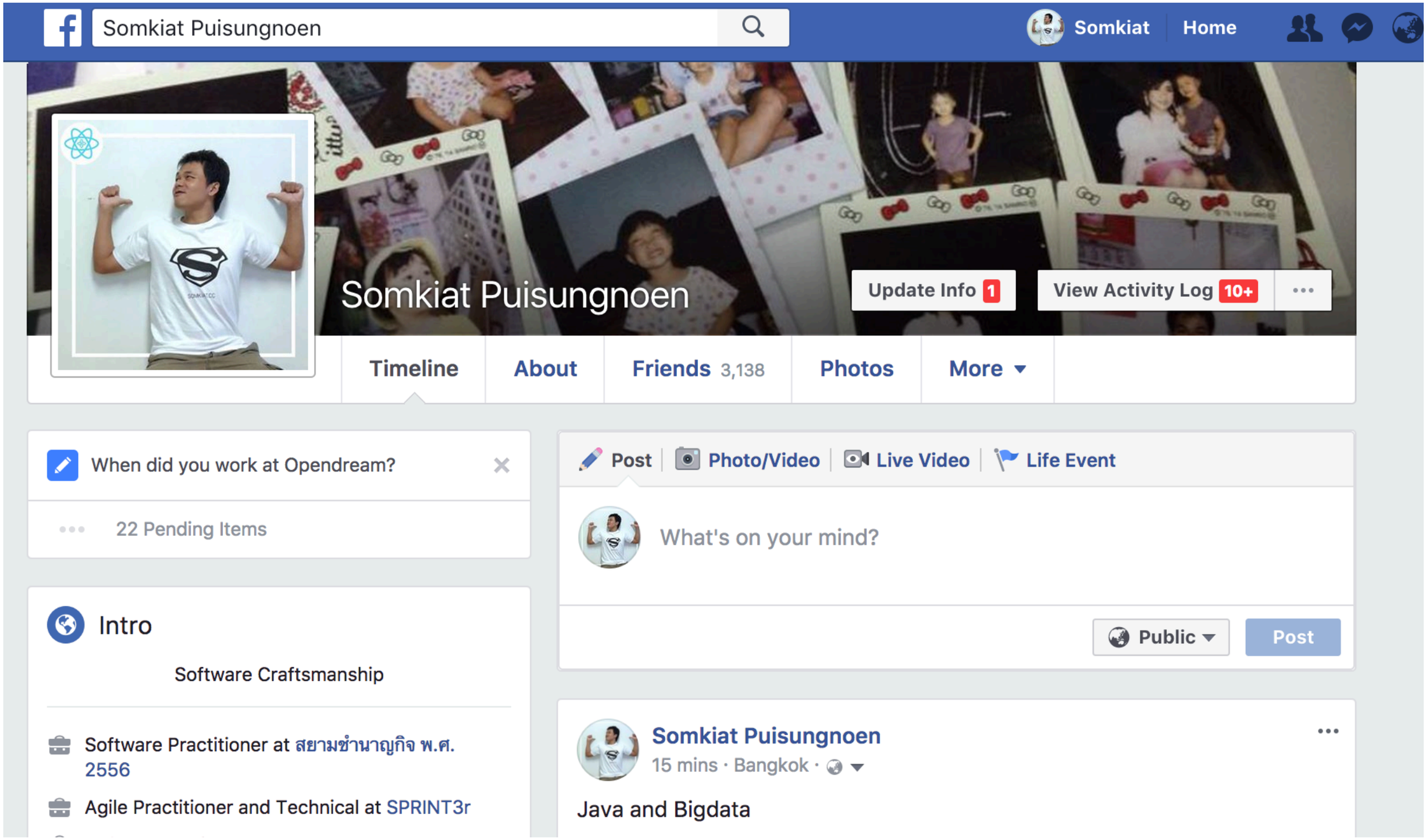
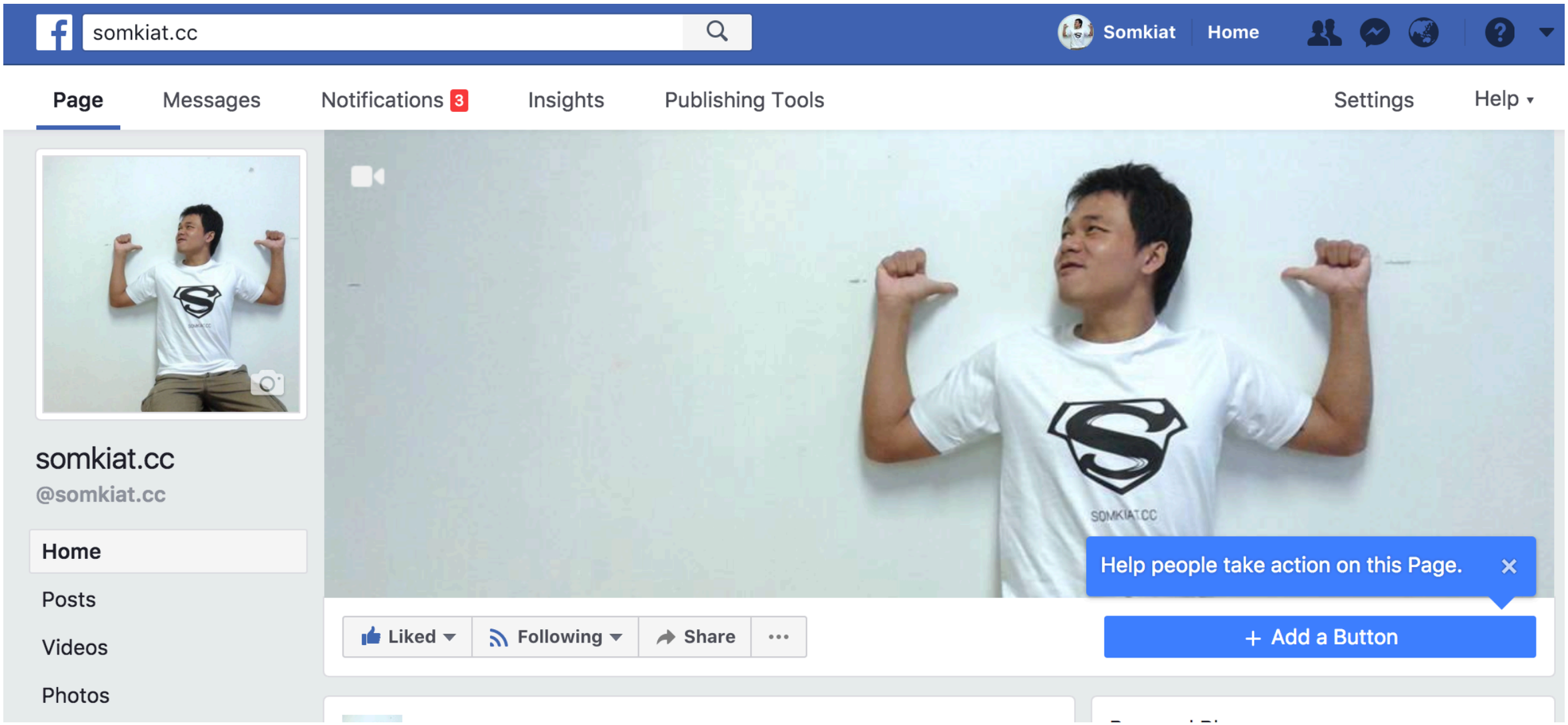
สยามชำนาญกิจ
SIAM CHAMNAN KIT

# Workshop :: Automated testing



# Agenda

- Introduction of testing
- Why we need to test ?
- Types of tests
- Testing pyramid concept
- iOS app testing
- Workshop (step-by-step)

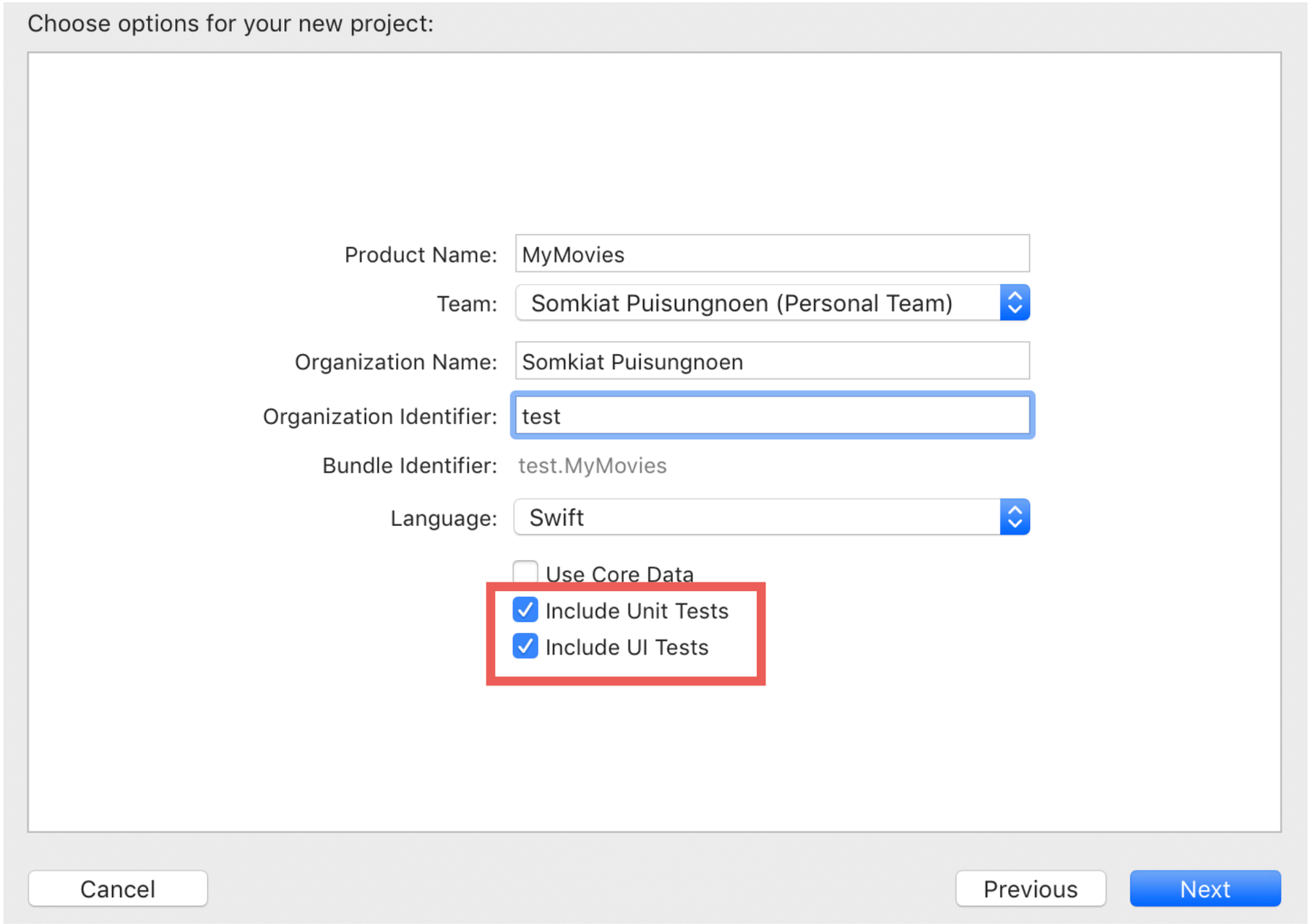
https://github.com/up1/workshop-ios-testing

# How to write first unit tests ?

Working with XCTest
Add tests to your project
Running unit tests in XCode
Write unit tests

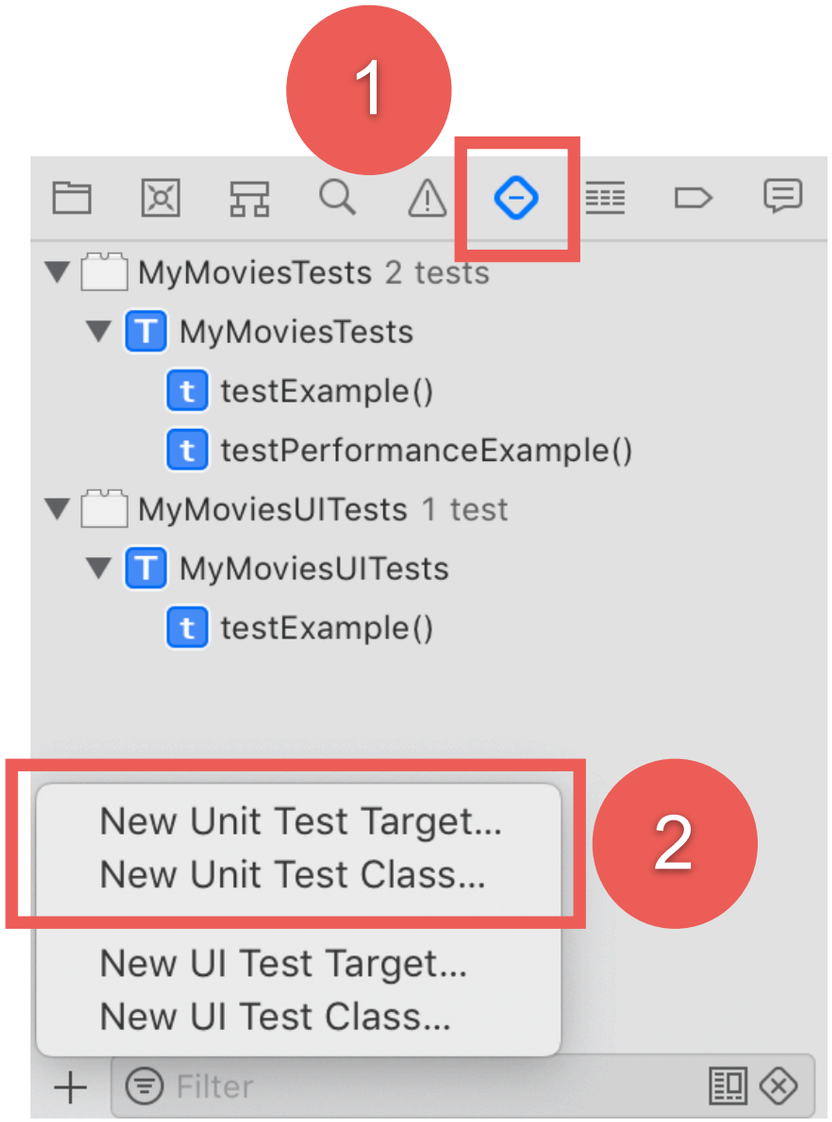
https://developer.apple.com/documentation/xctest

# Create project with Unit tests



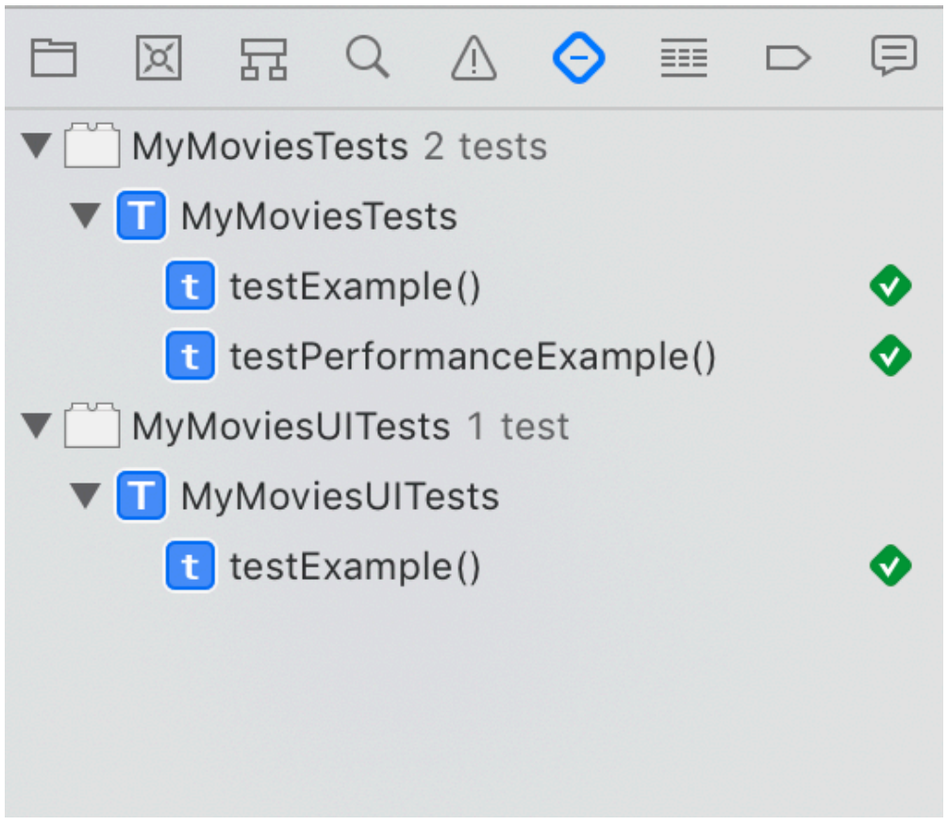
# Add unit tests to existing project

Test navigation -> New Unit Test Target



# Running unit tests in XCode

Product -> Test (command + U)



# What should you test first ?

# What should you test first ?

Requirements ?

You won’t be able to test all the requirements

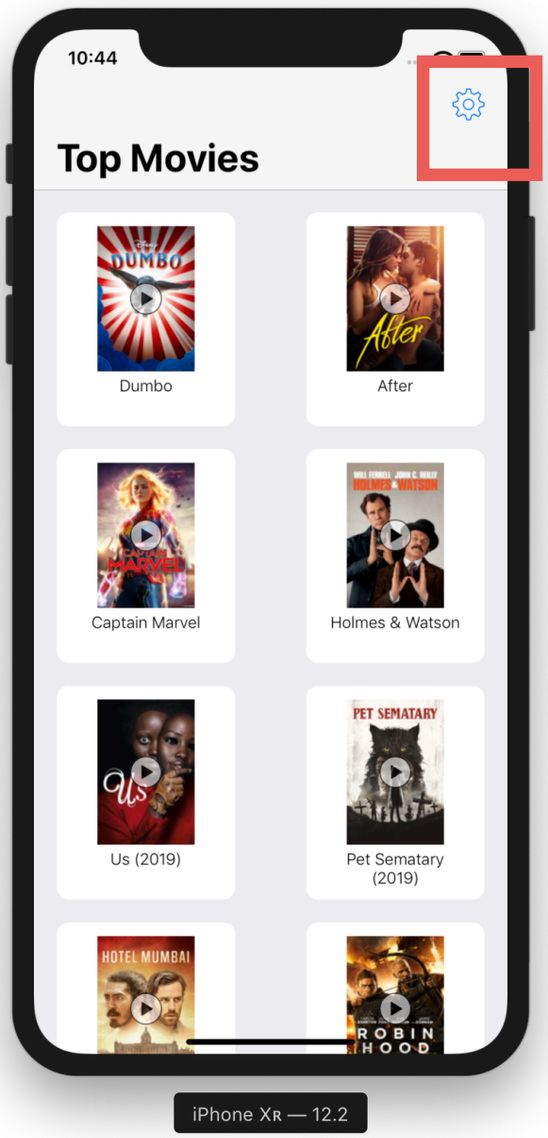
# What should you test first ?

But if you can test some of them,
You'll able to quickly verify your app meet requirement

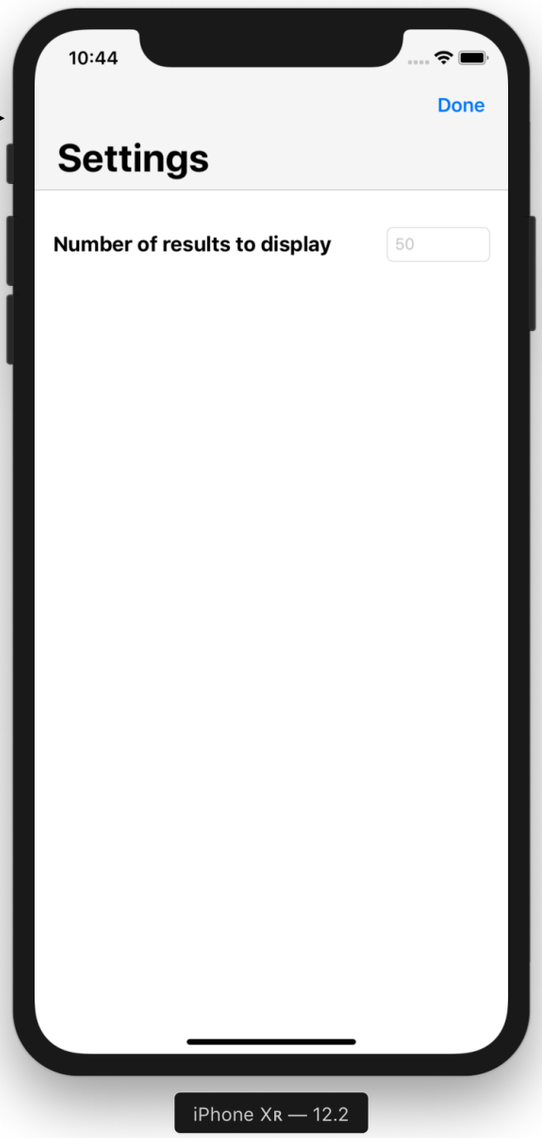
# Requirements(1)

## My Movies App from iTunes

Tops movies page



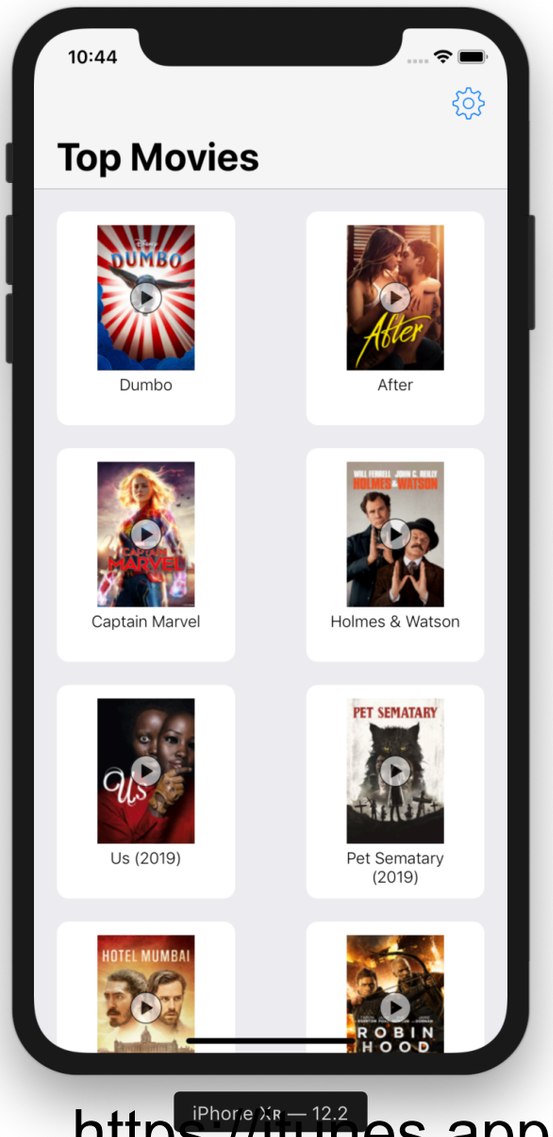

Settings page

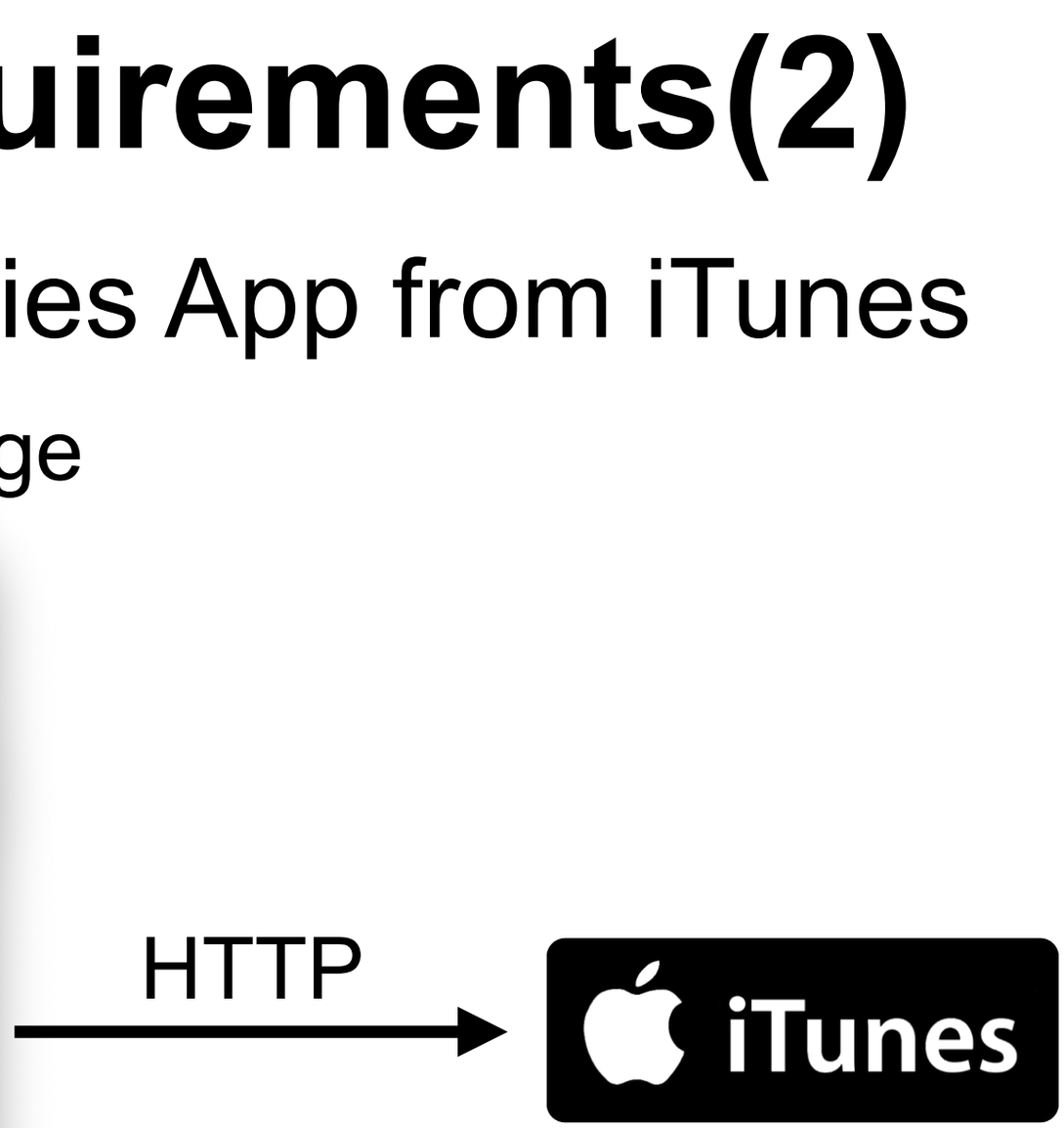


# Requirements(2)

## My Movies App from iTunes

### Tops movies page



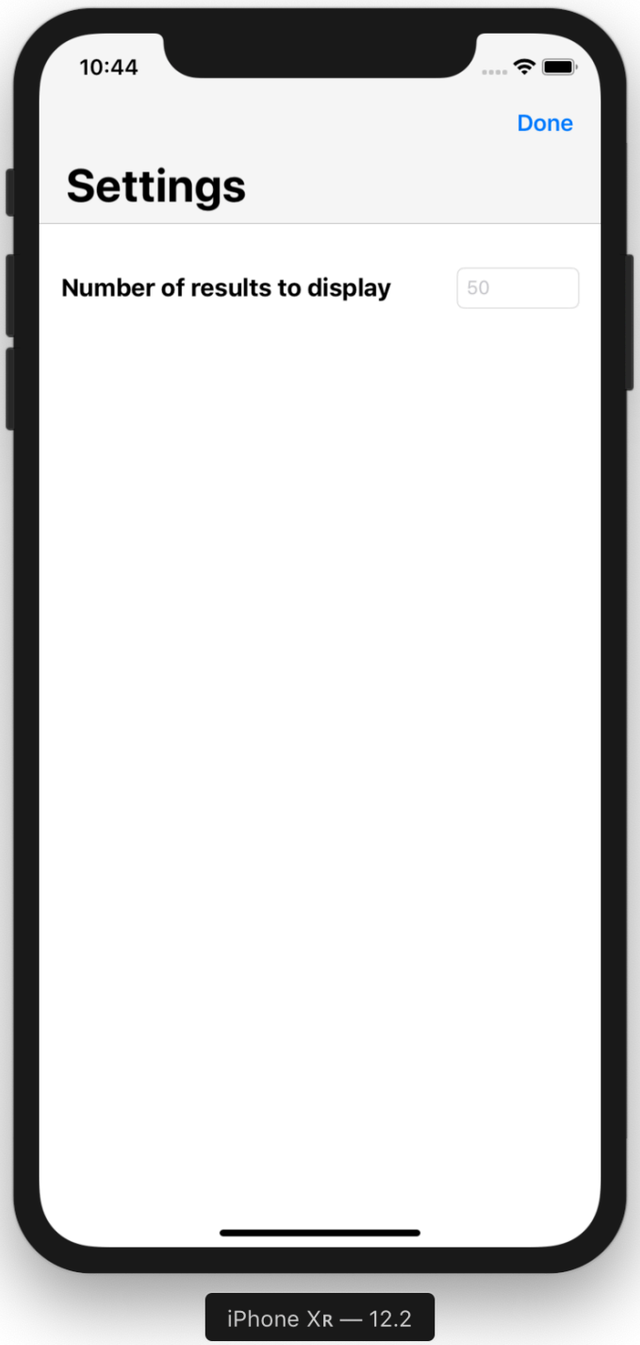




https://itunes.apple.com/us/rss/topmovies/limit=50/json

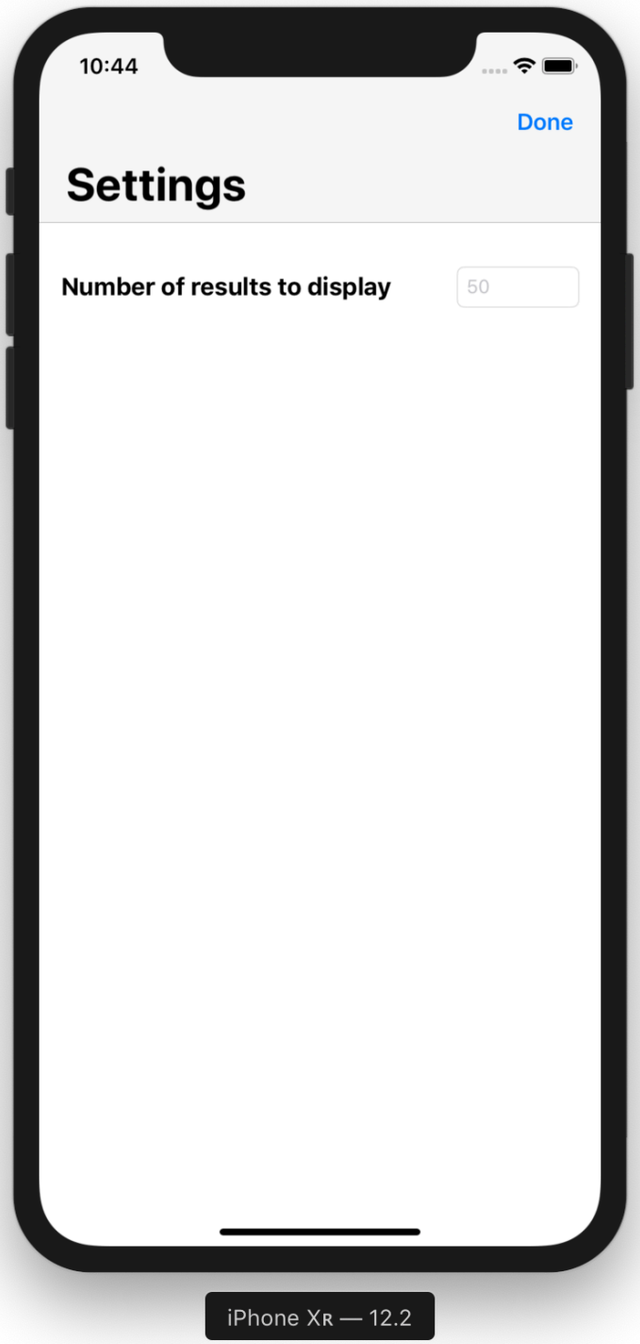
# Let’s start with easy part

## Settings page

# Settings page



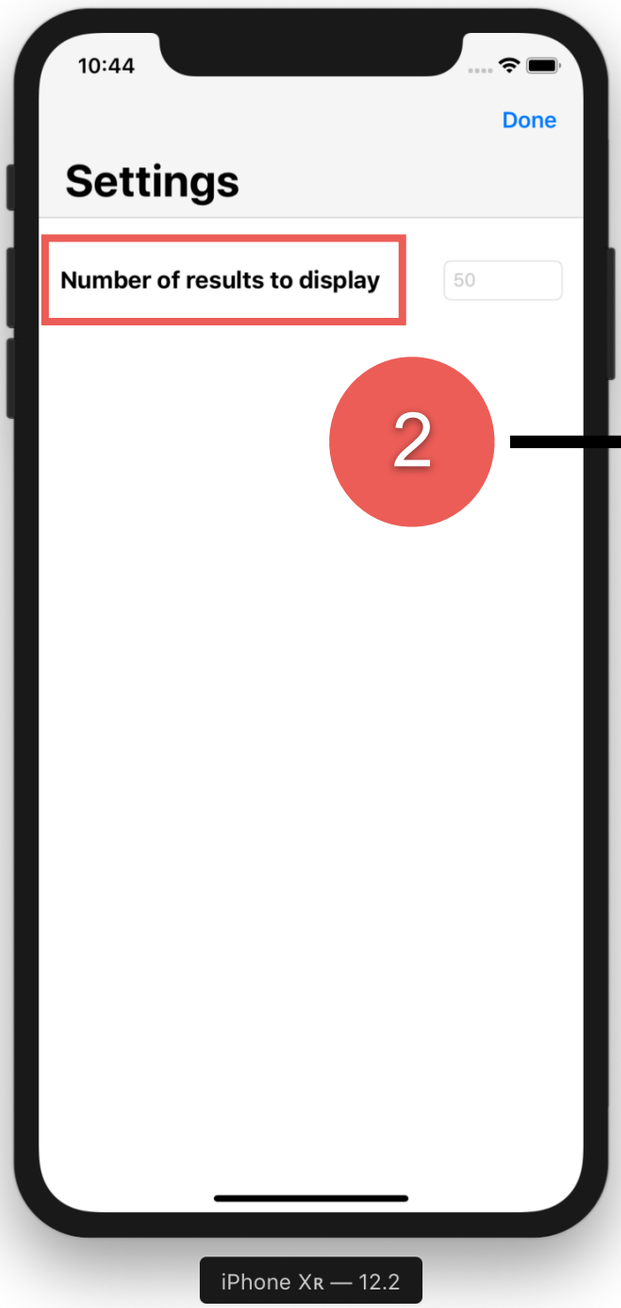
# What should we test ?



# What should we test ?

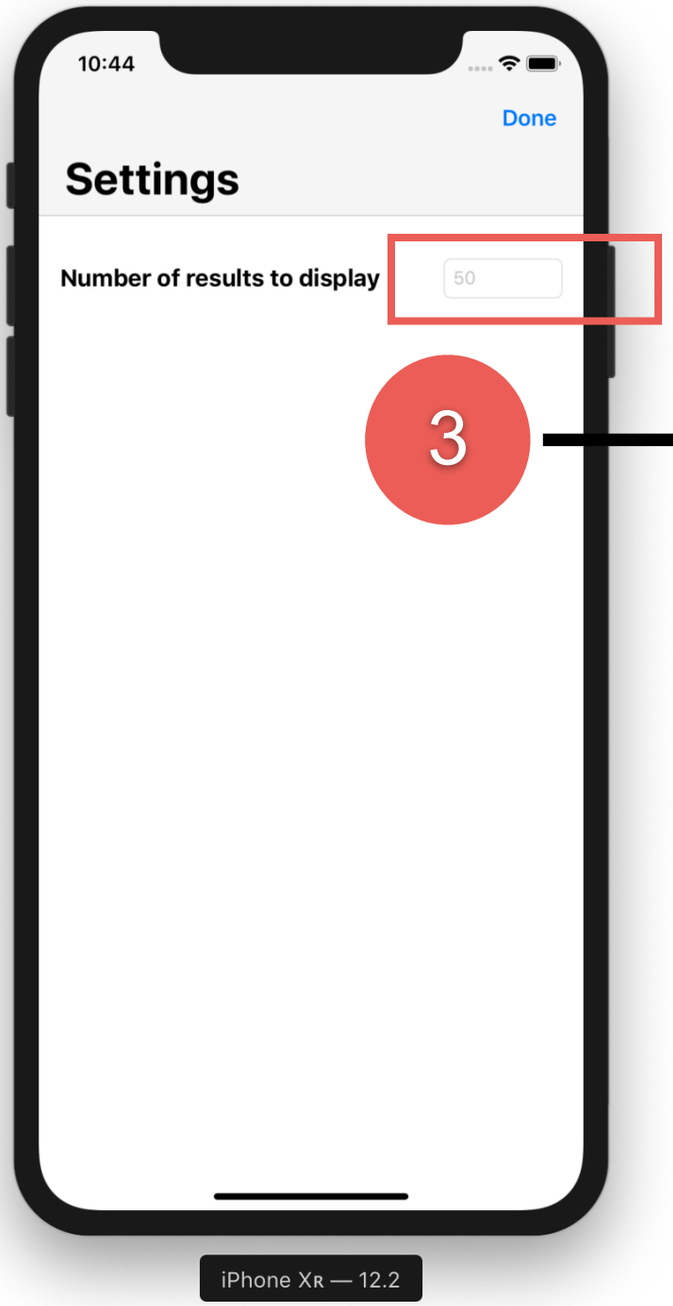

Title of screen is **Settings**

# What should we test ?




Label should display
**“Number of results to display”**

# What should we test ?



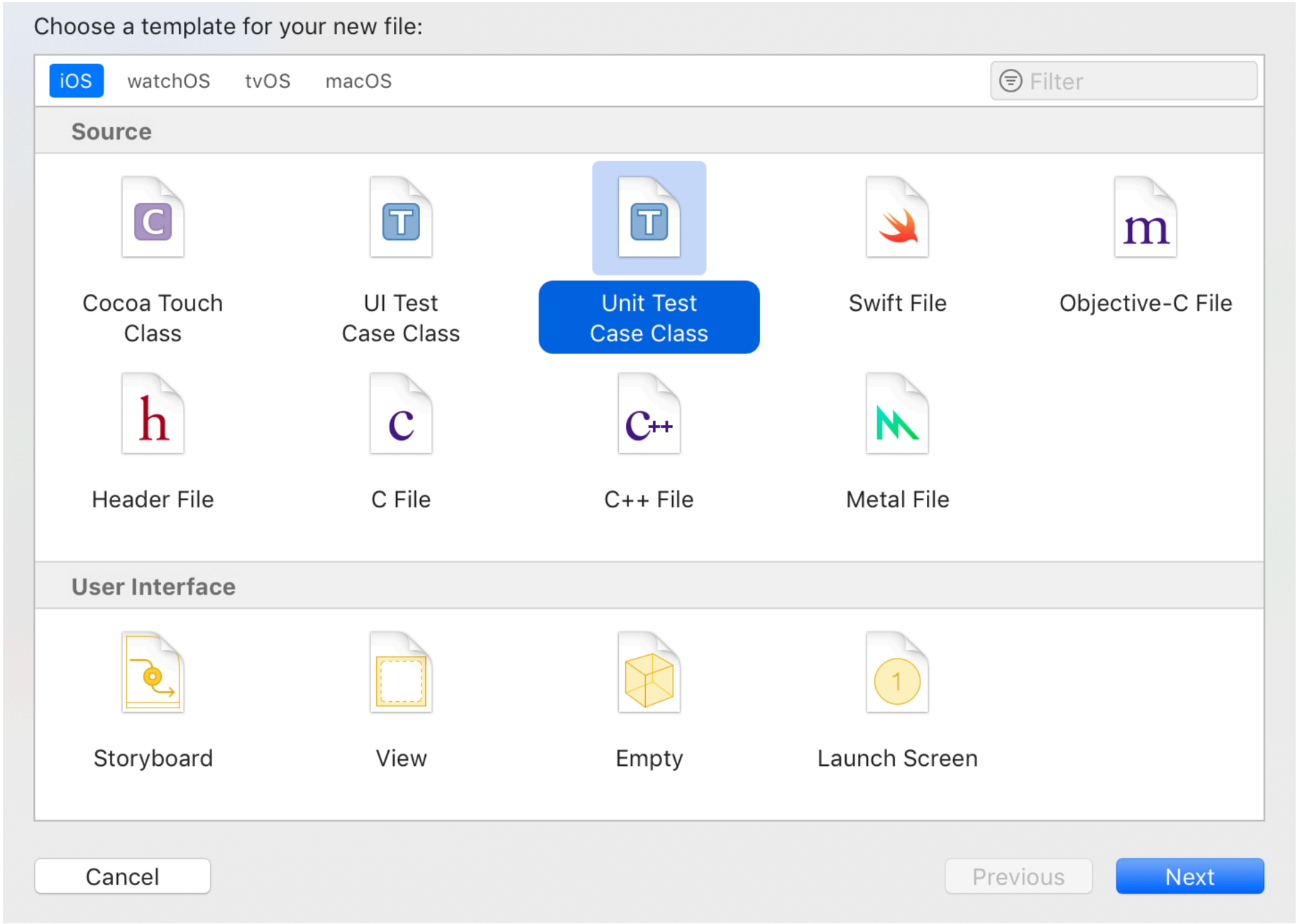

Verify placeholder text in text field
Should be **50**

# Write tests…

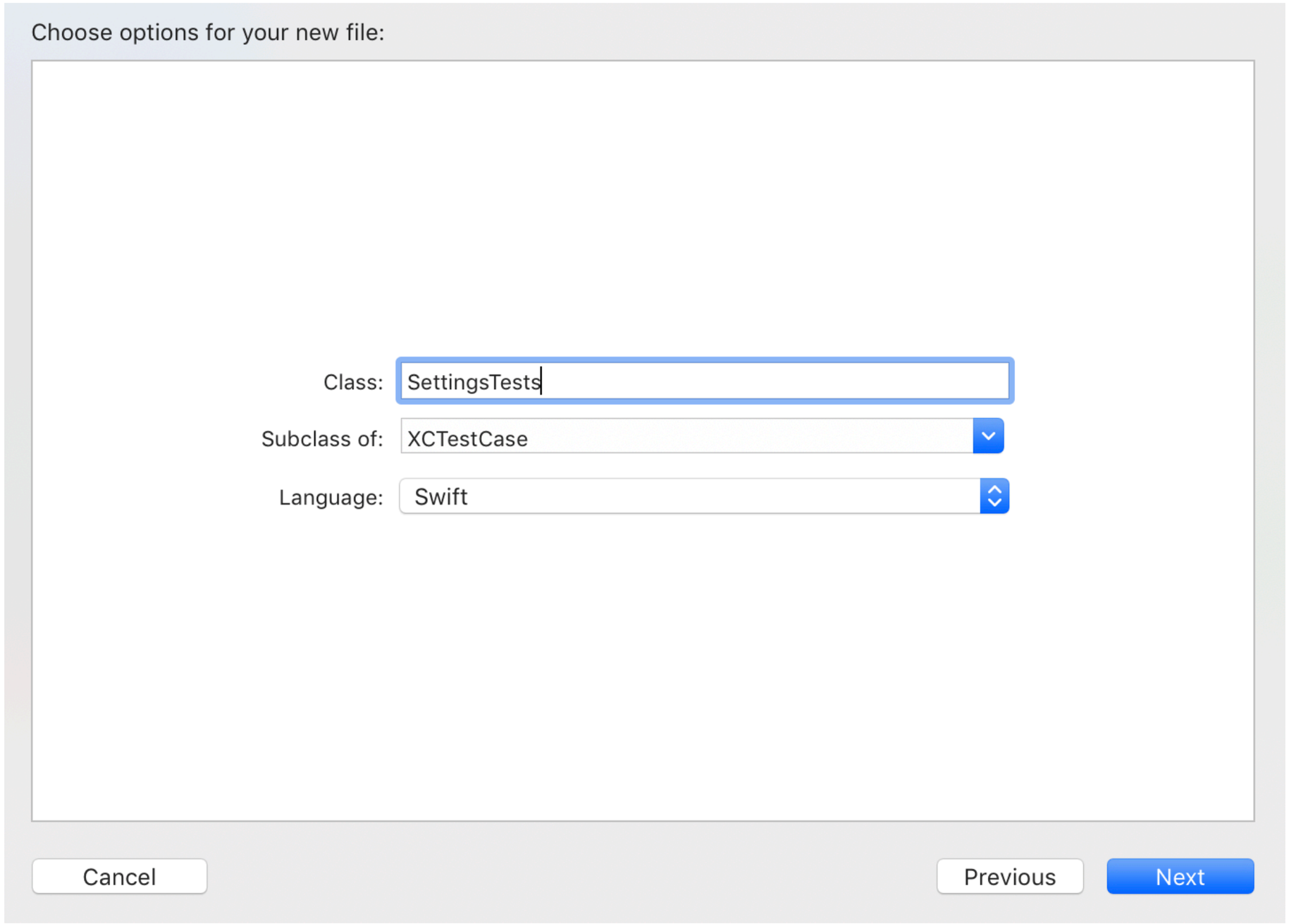
# Create Unit Tests

File name = SettingsTests.swift

# Create Unit Tests (1)



# Create Unit Tests (2)



# Ready !!

```
import XCTest
@testable import MyMovies

class SettingsTests: XCTestCase {

    func testExample() {
        // Arrange

        // Act

        // Assert

    }

}
```

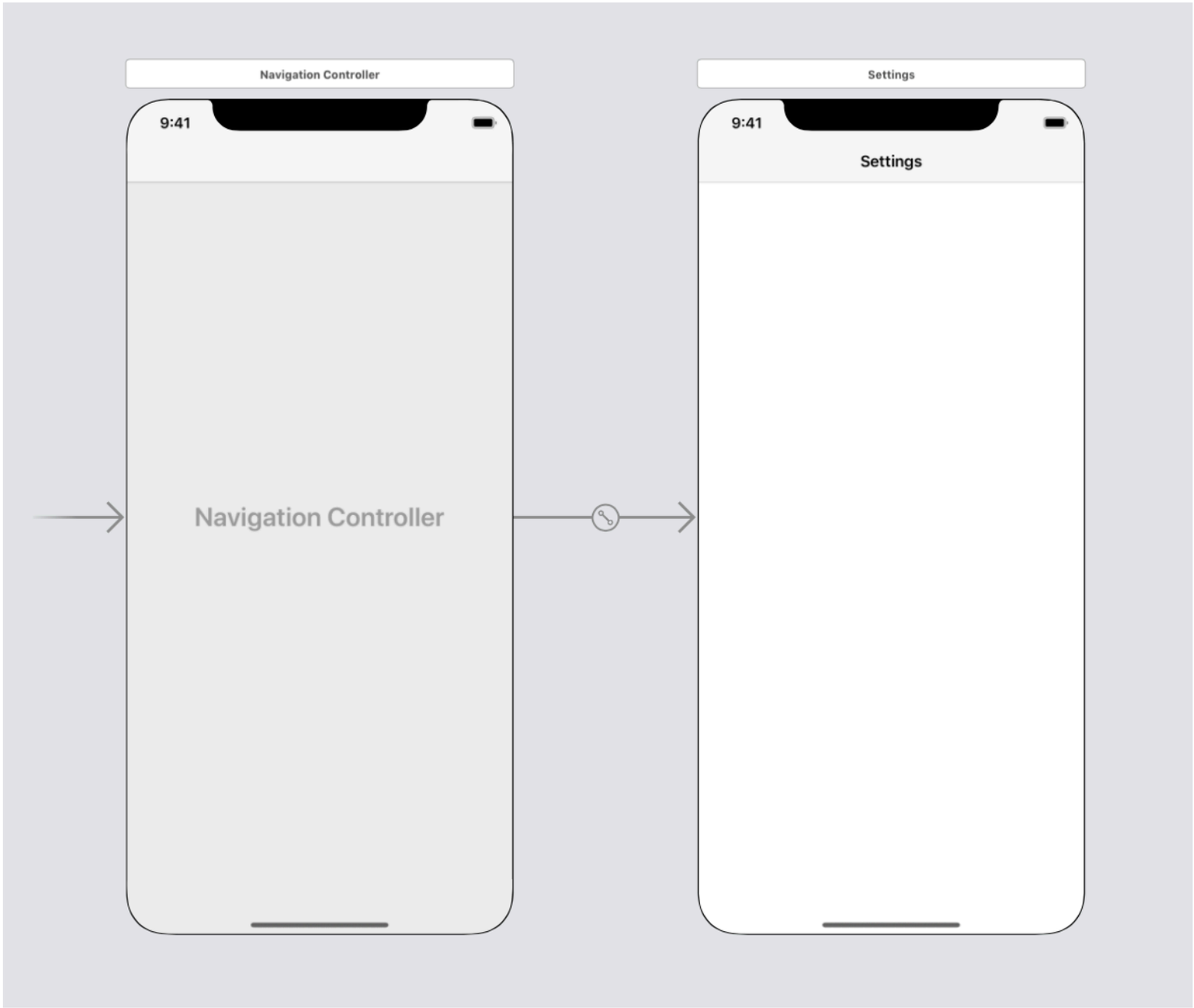
# First test case

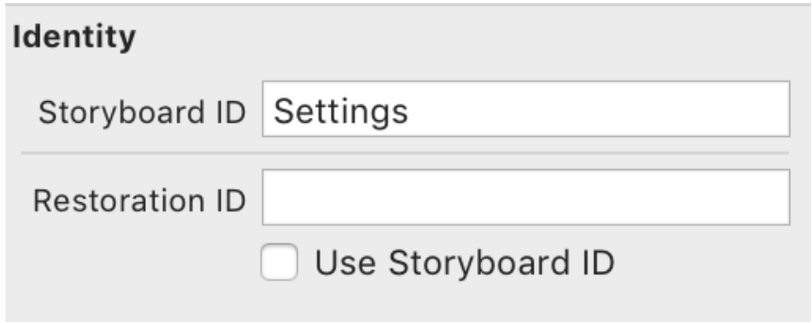
## Title of screen is **Settings**

```
class SettingsTests: XCTestCase {

    func test_title_is_Settings() {
        // Arrange
        let storyboard = UIStoryboard(name: "Main", bundle: nil)

        // Act
        let vc = storyboard.instantiateViewController(withIdentifier:
            "Settings")

        let _ = vc.view

        // Assert
        XCTAssertEqual(vc.navigationItem.title, "Settings")

    }

}
```

# Make test pass !!

## Create new ViewController in Main storyboard



# Second test case

## Verify text on Label

```
func test_label_text_is_Number_of_results_to_display() {
    // Arrange
    let storyboard = UIStoryboard(name: "Main", bundle: nil)

    // Act
    let vc = storyboard.instantiateViewController(withIdentifier:
        "Settings") as! SettingsViewController

    let _ = vc.view // Load view in unit test (called ViewDidLoad)

    XCTAssertEqual(vc.label.text!, "Number of results to display")
}
```

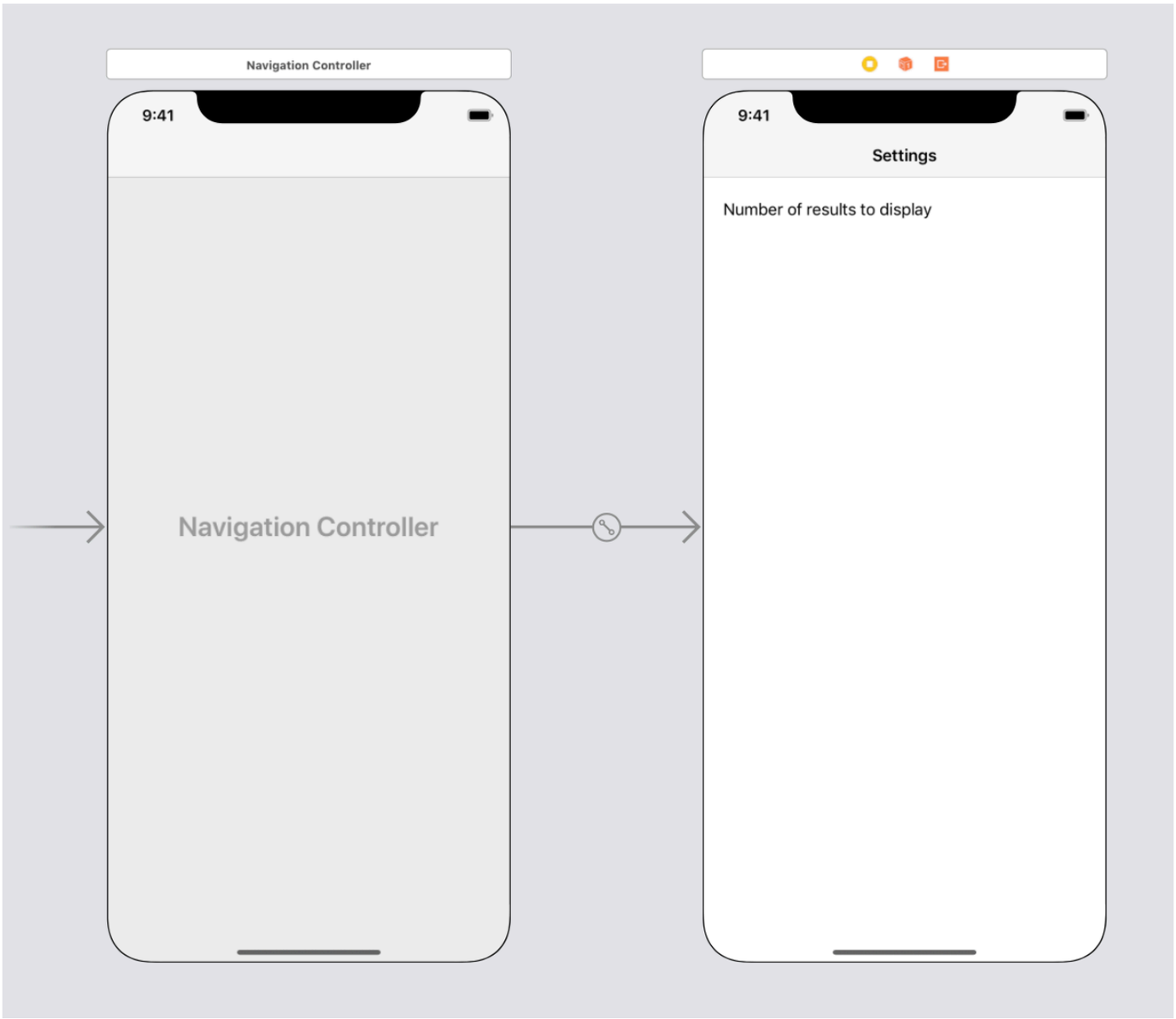
# Make test pass !!

## Create new **SettingsViewController.swift**

```
import UIKit
class SettingsViewController: UIViewController {

    @IBOutlet weak var label: UILabel!

}
```

# Make test pass !!

## Add **UILabel** in storyboard



# Stop !!

# Remove duplication code !!

# Duplication code

```
func test_title_is_Settings() {
    // Arrange
    let storyboard = UIStoryboard(name: "Main", bundle: nil)
    // Act
    let vc = storyboard.instantiateViewController(withIdentifier: "Settings")
    let _ = vc.view // Load view in unit test (called ViewDidLoad)

    // Assert
    XCTAssertEqual(vc.navigationItem.title, "Settings")

}

func test_label_text_is_Number_of_results_to_display() {
    // Arrange
    let storyboard = UIStoryboard(name: "Main", bundle: nil)
    // Act
    let vc = storyboard.instantiateViewController(withIdentifier: "Settings") as!
        SettingsViewController
    let _ = vc.view // Load view in unit test (called ViewDidLoad)

    XCTAssertEqual(vc.label.text!, "Number of results to display")
}
```

# Remove Duplication code

```
func test_title_is_Settings() {
    let vc = settingsViewController()
    XCTAssertEqual(vc.navigationItem.title, "Settings")
}

func test_label_text_is_Number_of_results_to_display() {
    let vc = settingsViewController()
    XCTAssertEqual(vc.label.text!, "Number of results to display")
}
```

```
func settingsViewController() -> SettingsViewController {
    let storyboard = UIStoryboard(name: "Main", bundle: nil)
    let vc = storyboard.instantiateViewController(withIdentifier: "Settings") as!
        SettingsViewController
    let _ = vc.view
    return vc
}
```

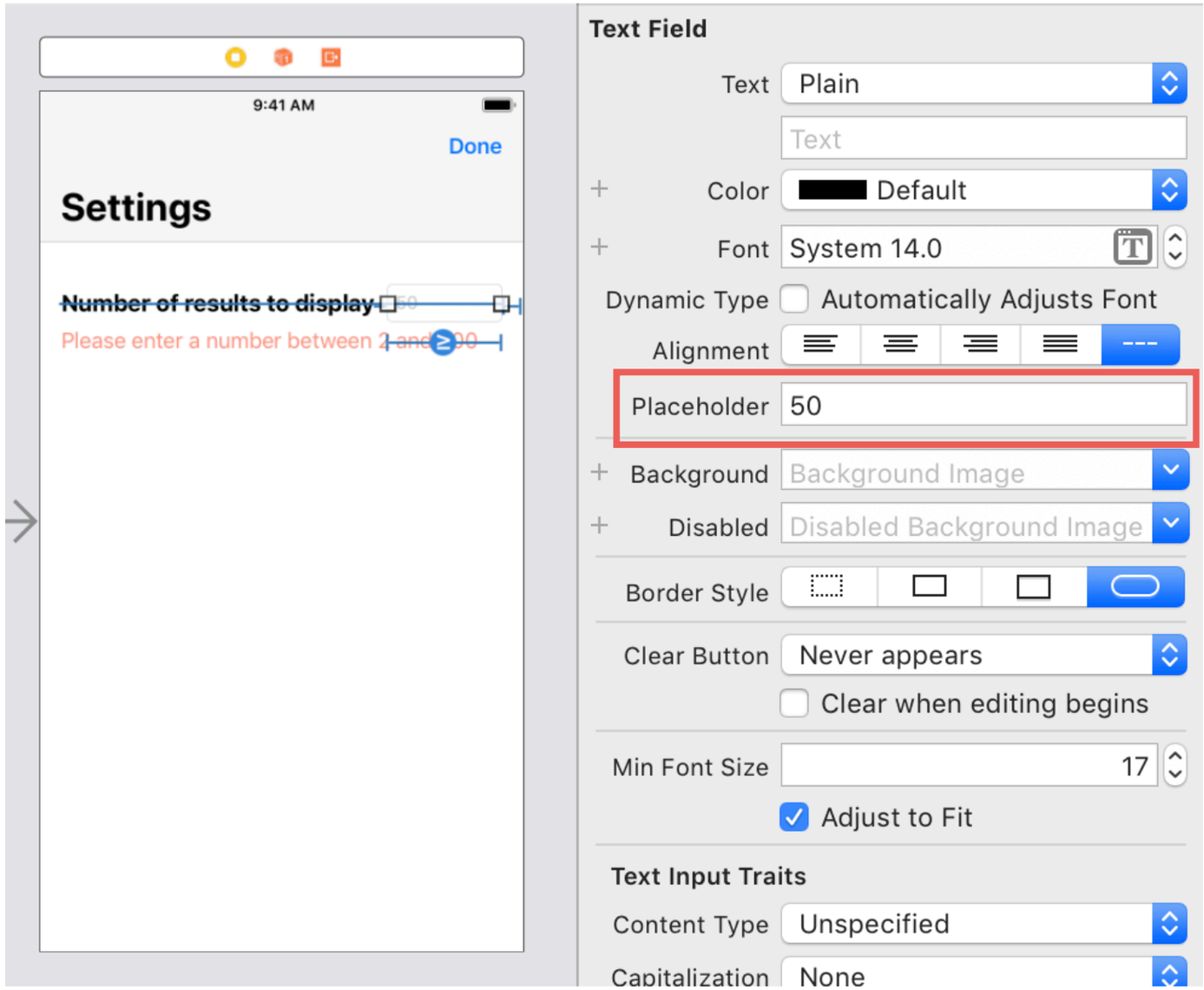
# Third test case

Verify placeholder text on text field = 50

```
func test_number_placeholder_is_50() {
    let vc = settingsViewController()
    XCTAssertEqual(vc.number.placeholder!, "50")
}
```

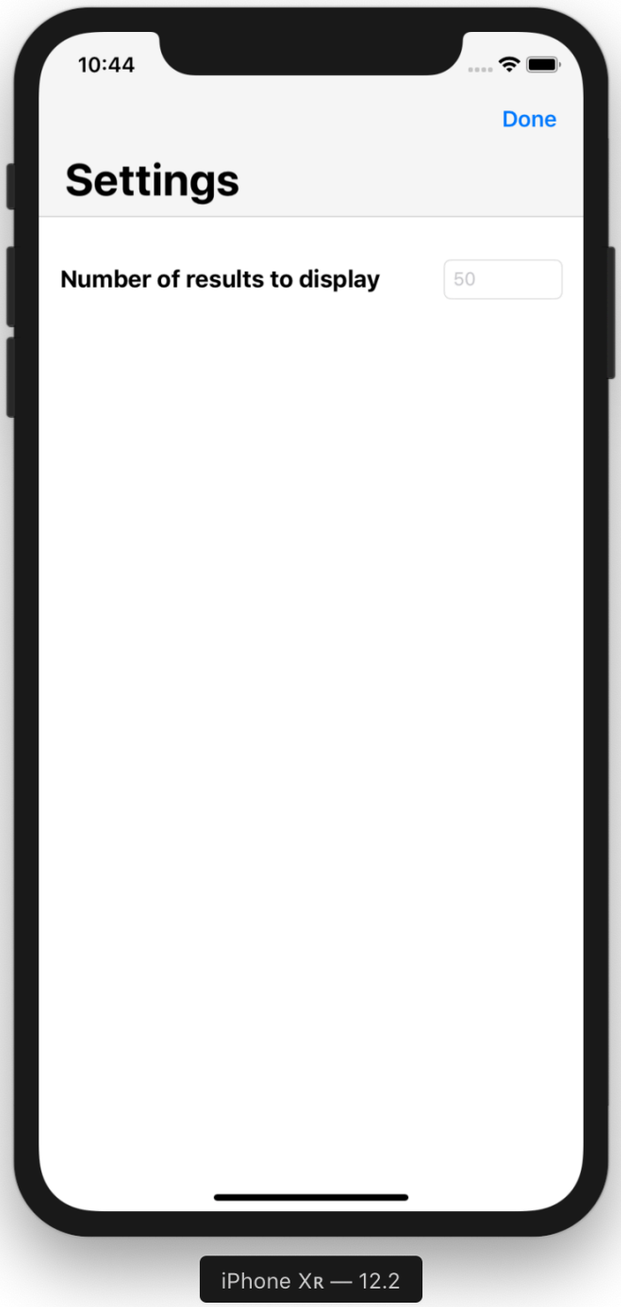
# Make test pass !!

## Add **UITextField** in storyboard



# More tests

# What should we test ?




Enter number and save ?

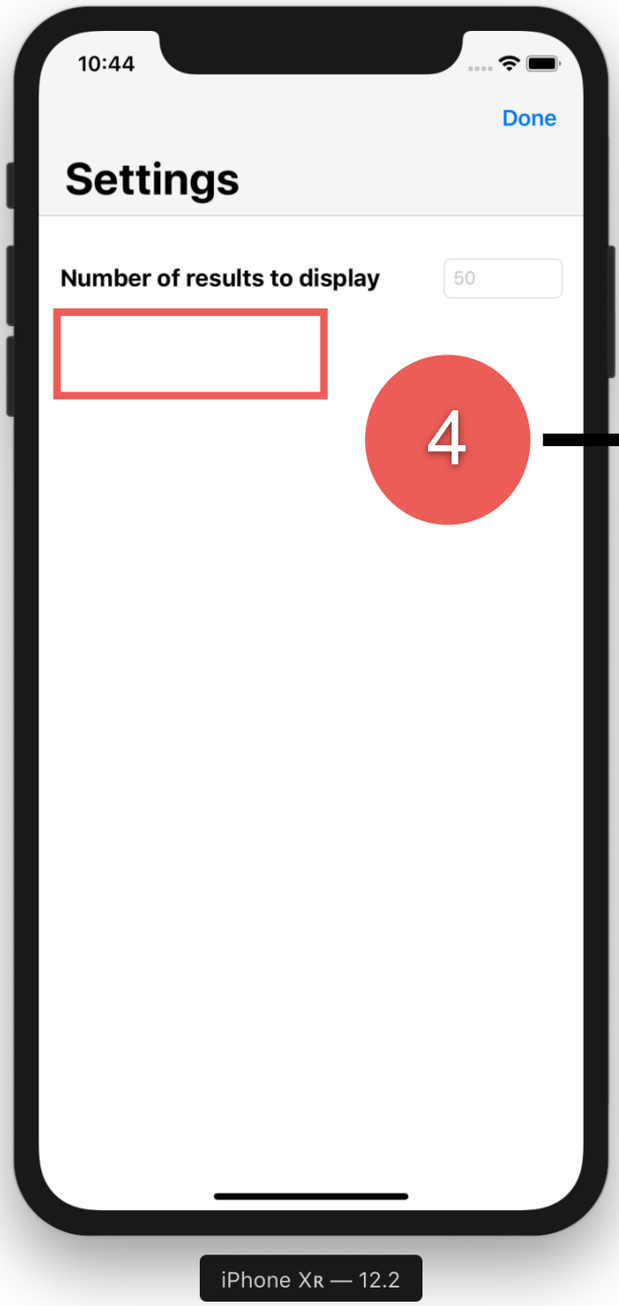
Range of number ?

Validate input is number or not ?

Show error message if validate failed ?

# Validate text entry

# Error message




Show **error** message
**“Please enter a number between 2 and 200”**

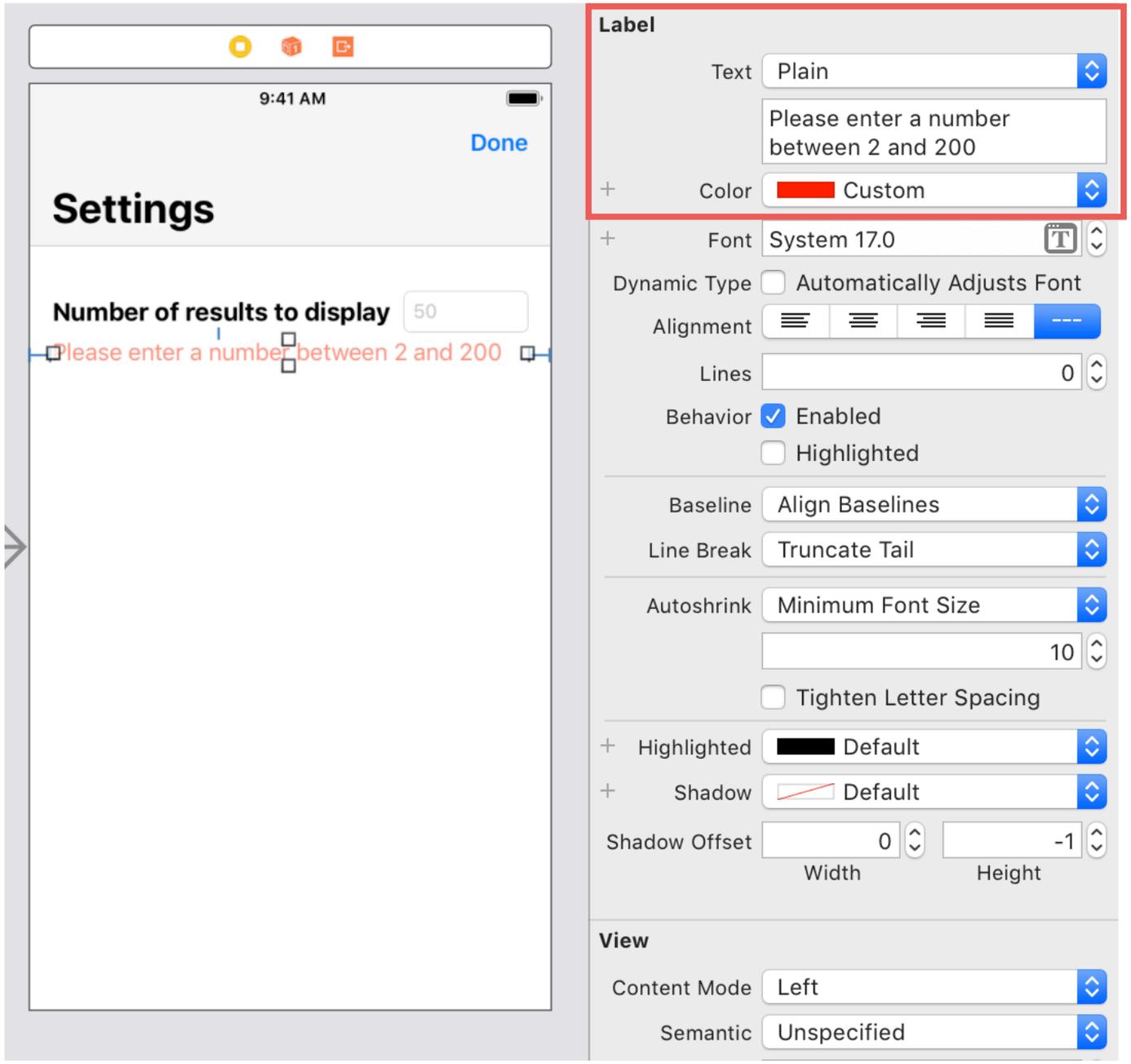
# Forth test case

## Verify text entry with error message

```
func test_error_text_is_Please_enter_a_number_between_2_and_200() {
    let vc = settingsViewController()
    XCTAssertEqual(vc.error.text!,
                   "Please enter a number between 2 and 200")
}
```

# Make test pass !!

## Add **UILabel** in storyboard



# Waiting …

# Stage of error message

# State of error message

Open settings page, **error is hidden**

When user enters text in number field that not a number, should **display error message**

# Error message is hidden

```
func test_error_is_hidden() {
    let vc = settingsViewController()
    XCTAssertTrue(vc.error.isHidden)
}
```

# Not show error when input is correct

Error message not show

```
func test_number_allows_2() {
    let vc = settingsViewController()
    let _ = vc.textField(vc.number,
        shouldChangeCharactersIn: NSRange(location: 0, length: 0),
        replacementString: "2")
    XCTAssertTrue(vc.error.isHidden)
}
```

# Not show error when input is correct

Error message not show

```
func test_number_allows_200() {
    let vc = settingsViewController()
    let _ = vc.textField(vc.number,
        shouldChangeCharactersIn: NSRange(location: 0, length: 0),
        replacementString: "200")
    XCTAssertTrue(vc.error.isHidden)
}
```

# Stop !!

# Remove duplication code !!

# Duplication code

```
func test_number_allows_2() {
    let vc = settingsViewController()
    let _ = vc.textField(vc.number,
        shouldChangeCharactersIn: NSRange(location: 0, length: 0),
        replacementString: "2")
    XCTAssertTrue(vc.error.isHidden)
}
```

```
func test_number_allows_200() {
    let vc = settingsViewController()
    let _ = vc.textField(vc.number,
        shouldChangeCharactersIn: NSRange(location: 0, length: 0),
        replacementString: "200")
    XCTAssertTrue(vc.error.isHidden)
}
```

# Remove Duplication code

## Create function **enterText()** with extension

```
extension SettingsViewController {
    func enterText(_ text: String) {
        _ = textField(number, shouldChangeCharactersIn: NSRange(location:
            number.text!.count, length: 0), replacementString: text)
    }
}
```

# Remove Duplication code

## Modify in test cases

```
func test_number_allows_2() {
    let vc = settingsViewController()
    vc.enterText("2")
    XCTAssertTrue(vc.error.isHidden)
}

func test_number_allows_200() {
    let vc = settingsViewController()
    vc.enterText("200")
    XCTAssertTrue(vc.error.isHidden)
}
```

# Out-of-range

“Please enter a number between 2 and 200”

```
func test_number_does_not_allow_1() {
    let vc = settingsViewController()
    vc.enterText("1")
    XCTAssertFalse(vc.error.isHidden)
}
```

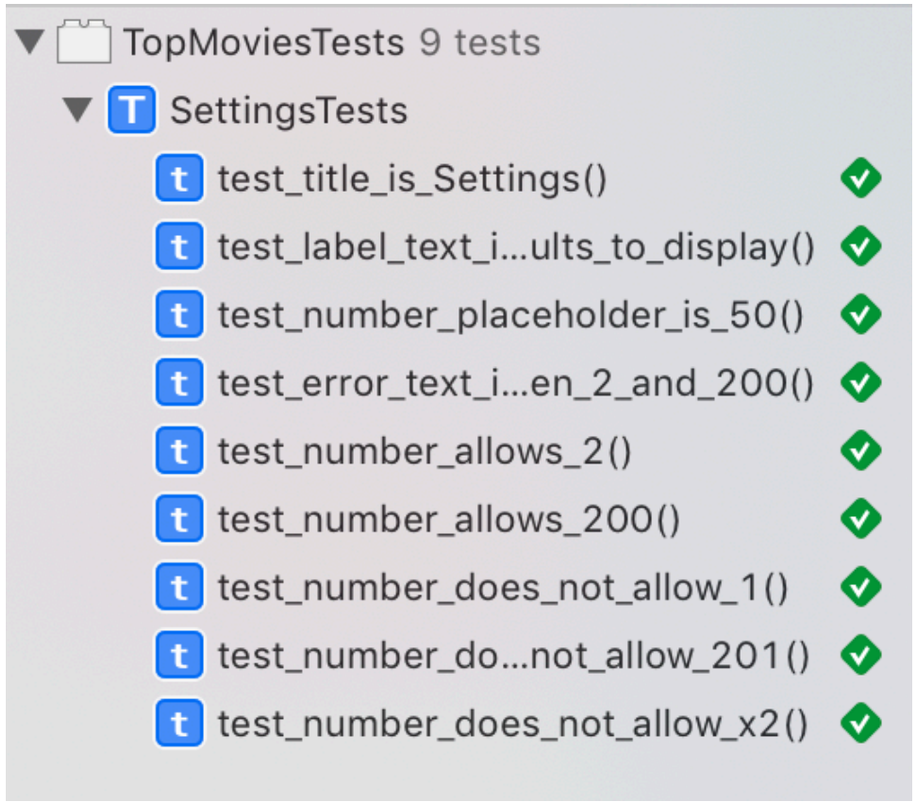
```
func test_number_does_not_allow_201() {
    let vc = settingsViewController()
    vc.enterText("201")
    XCTAssertFalse(vc.error.isHidden)
}
```

# Error when user enter incorrect text

"Please enter a number between 2 and 200"

```
func test_number_does_not_allow_x2() {
    let vc = settingsViewController()
    vc.enterText("x2")
    XCTAssertFalse(vc.error.isHidden)
}
```

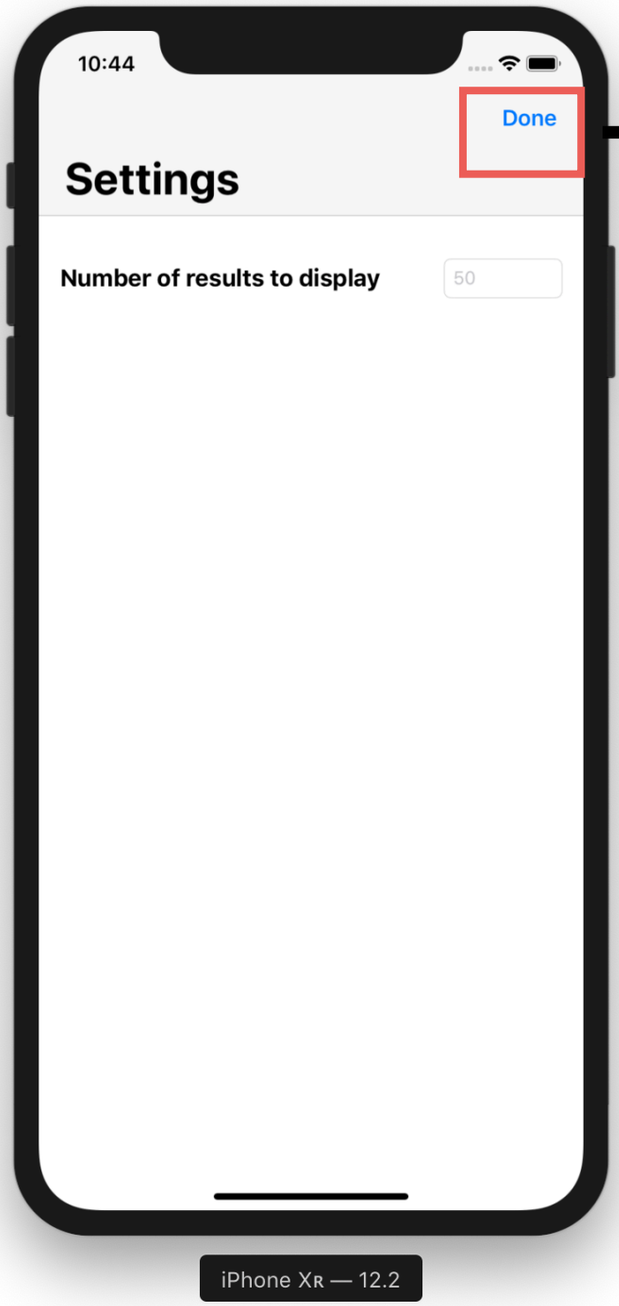
# Test results




# Code coverage

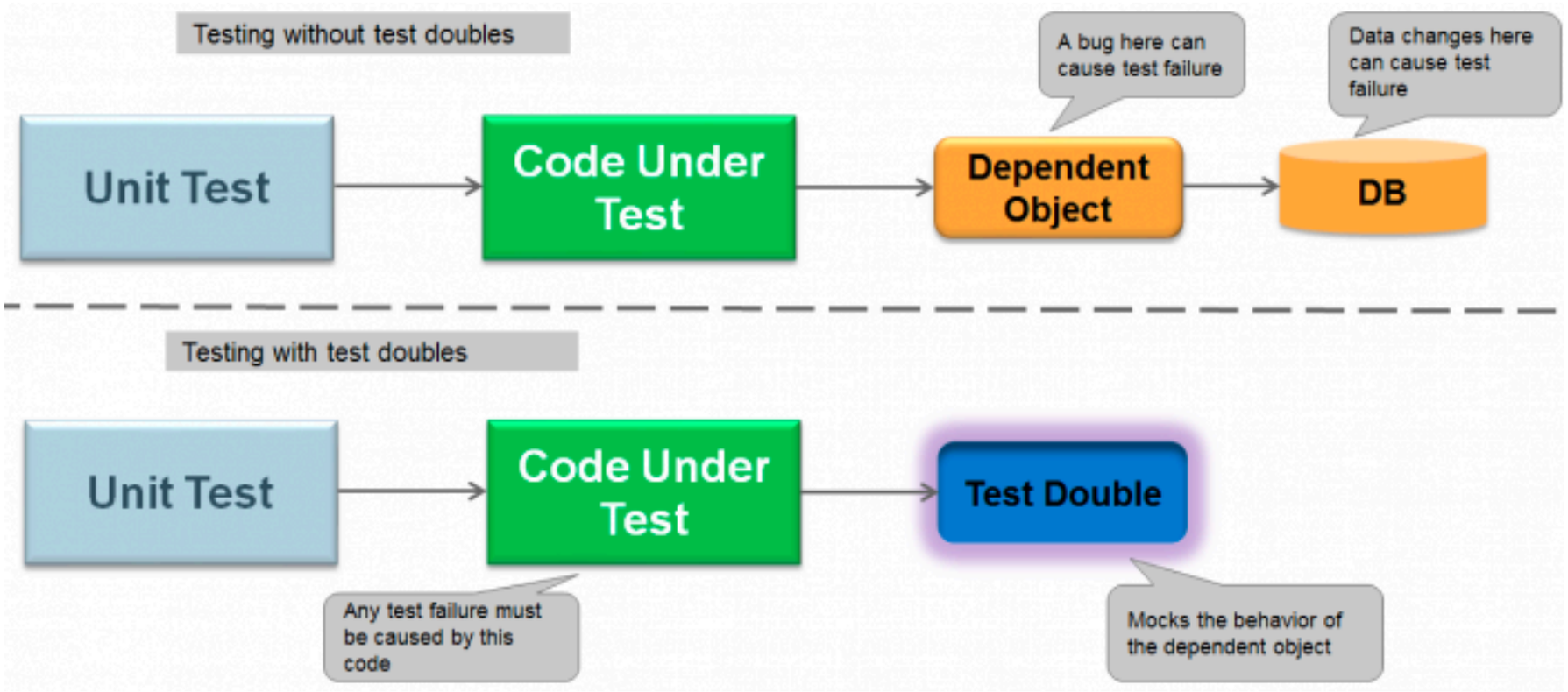
| Name | Coverage |
| --- | --- |
| TopMovies.app | 27.2% |
| MoviesViewController.swift | 18.4% |
| MoviesParser.swift | 0.0% |
| Movie.swift | 0.0% |
| MoviesRouter.swift | 100.0% |
| AppDelegate.swift | 33.3% |
| SettingsViewController.swift | 61.3% |
| MoviesClient.swift | 31.0% |

# Working with dependencies

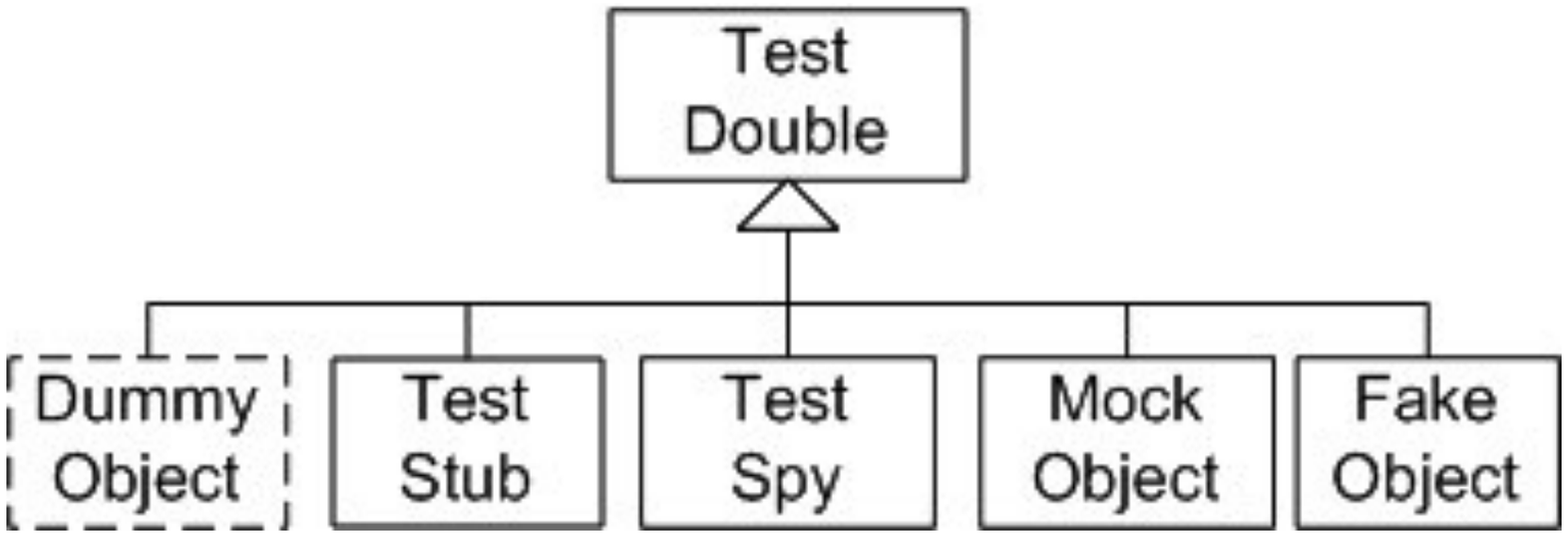



Save data in **UserDefaults !!**

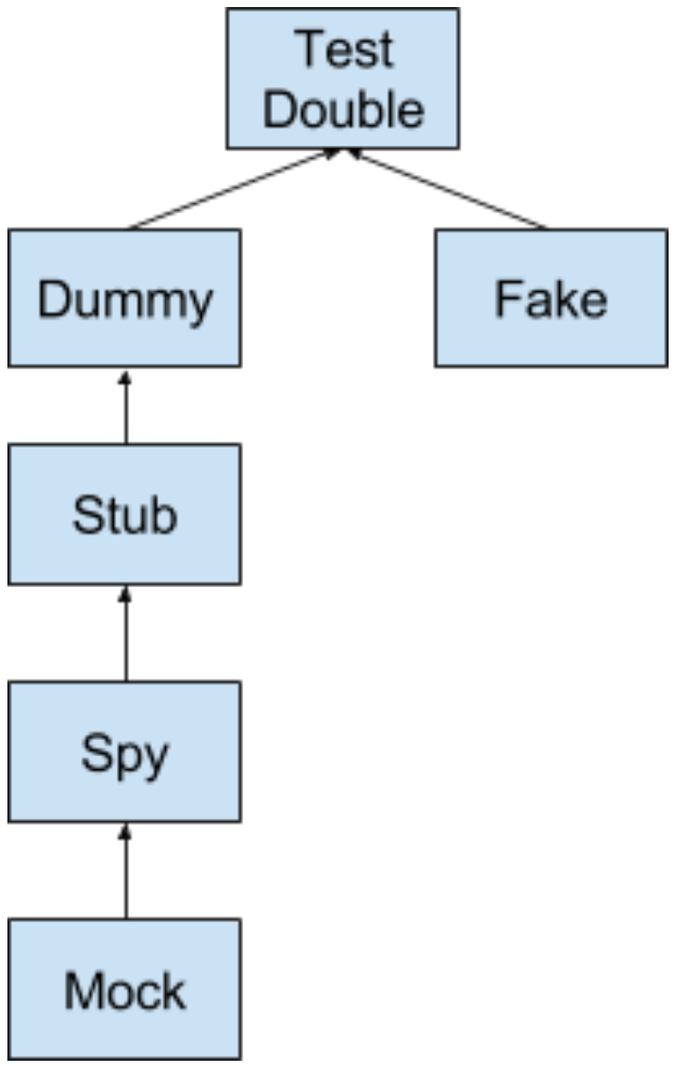
# Test Double



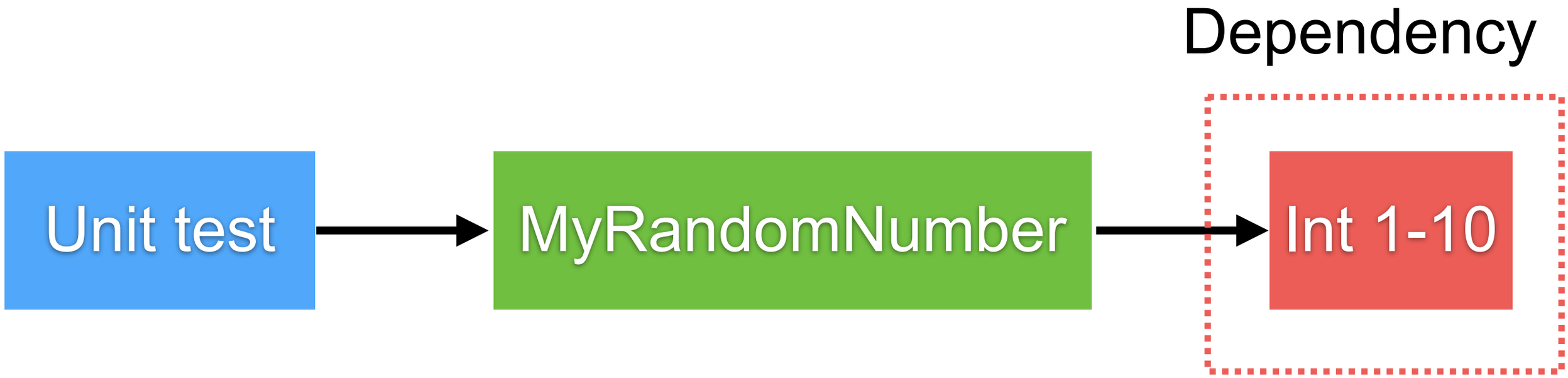

# Test Double



# Test Double

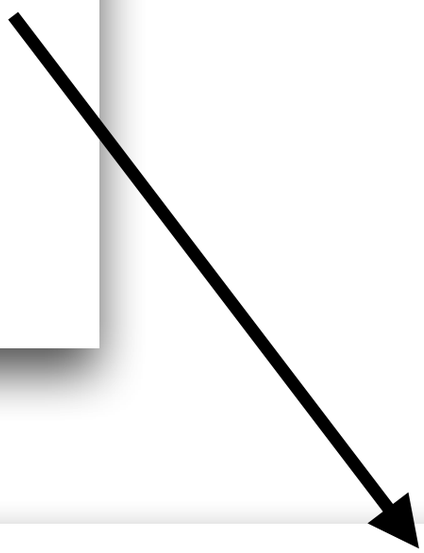



# Demo :: Random number



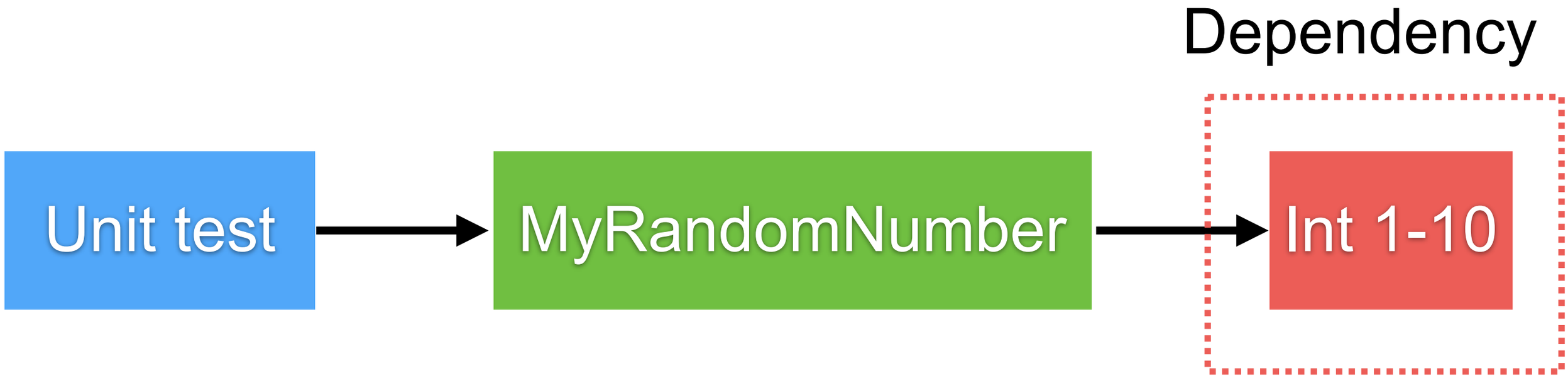
# How to control a dependency ?

```
class MyRandomNumberTest: XCTestCase {

    func test_random_should_be_5() {
        let my = MyRandomNumber()
        let result = my.getNumber()
        XCTAssertEqual(5, result)
    }

}
```

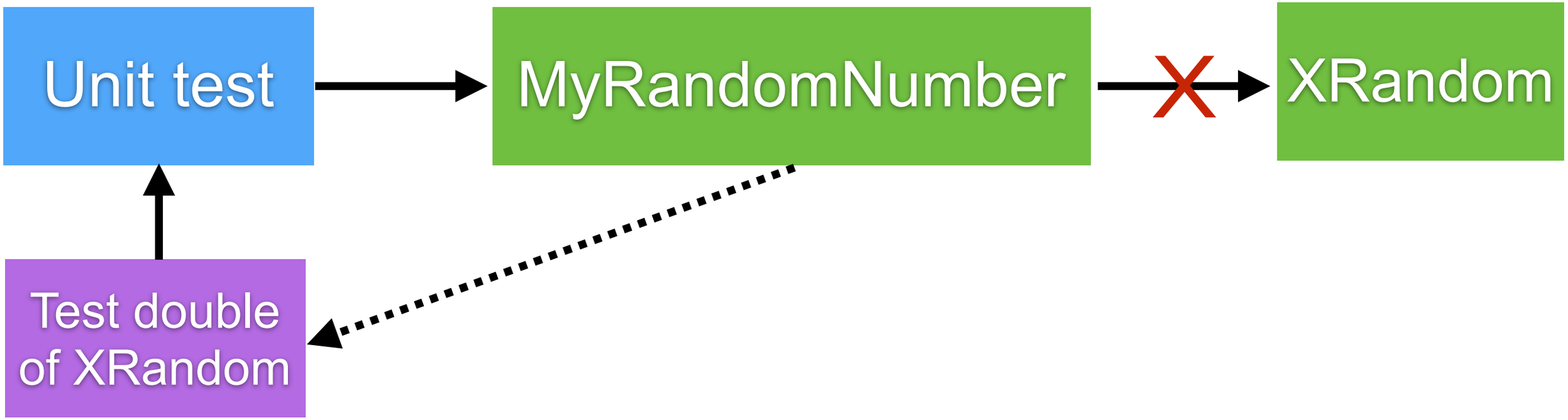


```
class MyRandomNumber {
    func getNumber() -> Int {
        return Int.random(in: 0...10)
    }
}
```

# Demo :: Random number




# Demo :: Random number

# Control dependency

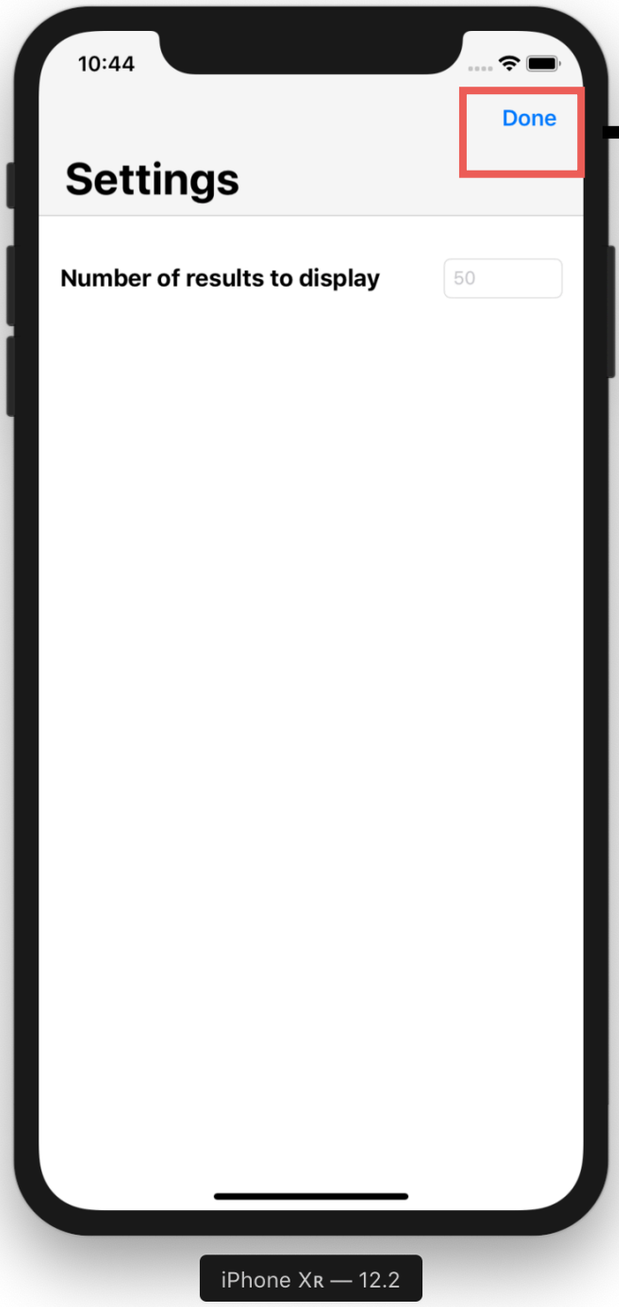
```
class MyRandomNumber {

    var xRandom: XRandom!

    func getNumber() -> Int {
        return xRandom.get()
    }
}

class XRandom {
    func get() -> Int {
        return Int.random(in: 0...10)
    }
}
```

# Testing again

```
class MyRandomNumberTest: XCTestCase {

    func test_random_should_be_5() {
        let my = MyRandomNumber()
        my.xRandom = StubXRandom5()
        let result = my.getNumber()
        XCTAssertEqual(5, result)
    }

}

class StubXRandom5: XRandom {
    override func get() -> Int {
        return 5
    }
}
```

# Working with UserDefaults

# Working with dependencies




Save data in **UserDefaults !!**

# Fake UserDefaults

```
class FakeUserDefaults: UserDefaults {
    var store = [String: Any?]()

    override func setValue(_ value: Any?, forKey key: String) {
        store[key] = value
    }

    override func value(forKey key: String) -> Any? {
        if let value = store[key] {
            return value
        }
        return nil
    }
}
```

# Save data into UserDefaults

```
class SettingsWithUserDefaultsTests: SettingsTests {

    func test_save_number_from_UserDefaults() {
        // Arrange
        let vc = settingsViewController()
        let defaults = FakeUserDefaults()
        vc.userDefaults = defaults

        // Act = Save
        vc.enterText("2")
        XCTAssertEqual(2, defaults.value(forKey:
            UserDefaultsKeys.numberOfResults.rawValue) as! Int)
    }
```

# Remove data in UserDefaults

```
func test_remove_number_from_UserDefaults() {
    // Arrange
    let vc = settingsViewController()
    let defaults = FakeUserDefaults()
    vc.userDefaults = defaults

    // Act = Remove
    vc.number.text = ""
    vc.enterText("")
    XCTAssertNil(defaults.value(forKey: UserDefaultsKeys.numberOfResults.rawValue))
}
```

# Save and Remove

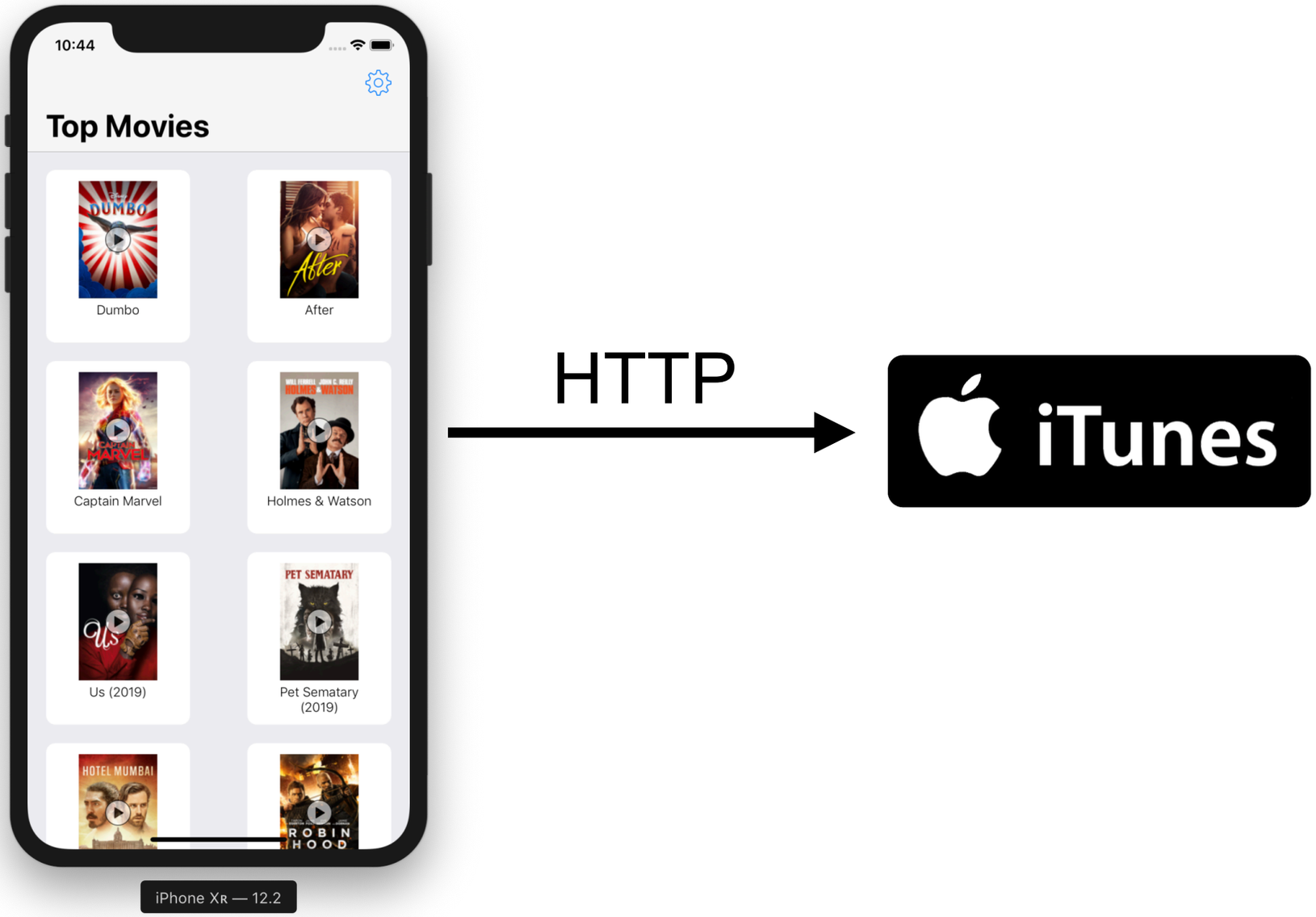
```
func test_save_and_remove_number_from_UserDefaults() {
    // Arrange
    let vc = settingsViewController()
    let defaults = FakeUserDefaults()
    vc.userDefaults = defaults

    // Act = Save
    vc.enterText("2")
    XCTAssertEqual(2, defaults.value(forKey:
        UserDefaultsKeys.numberOfResults.rawValue) as! Int)

    // Act = Remove
    vc.number.text = ""
    vc.enterText("")
    XCTAssertNil(defaults.value(forKey: UserDefaultsKeys.numberOfResults.rawValue))
}
```

# Code coverage

| Name | Coverage |
| --- | --- |
| TopMovies.app | 29.0% |
| MoviesViewController.swift | 18.4% |
| MyRandomNumber.swift | 50.0% |
| MoviesParser.swift | 0.0% |
| Movie.swift | 0.0% |
| MoviesRouter.swift | 100.0% |
| AppDelegate.swift | 33.3% |
| SettingsViewController.swift | 71.0% |
| MoviesClient.swift | 31.0% |

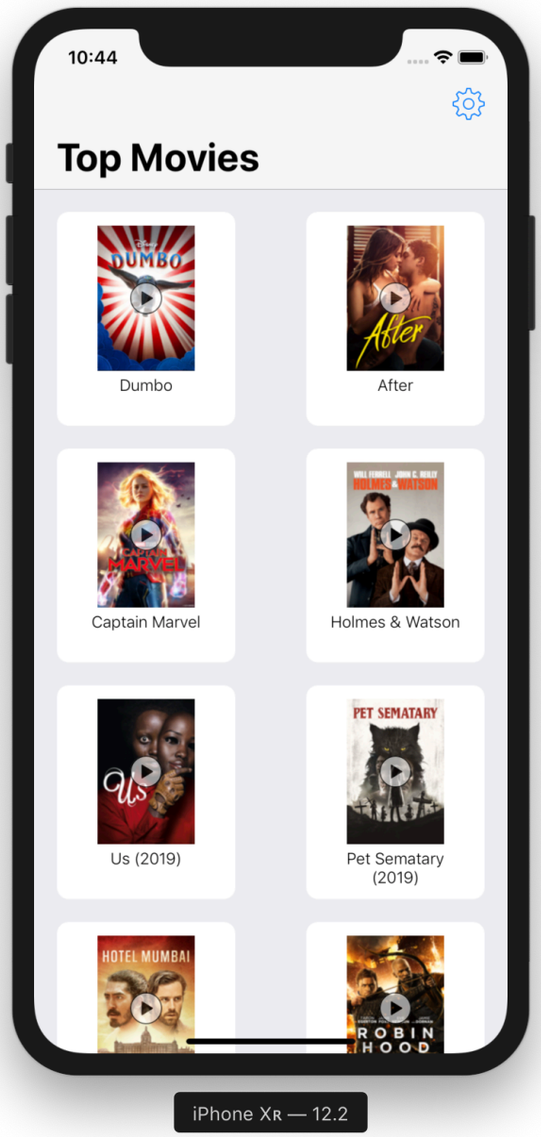
# Top movies page

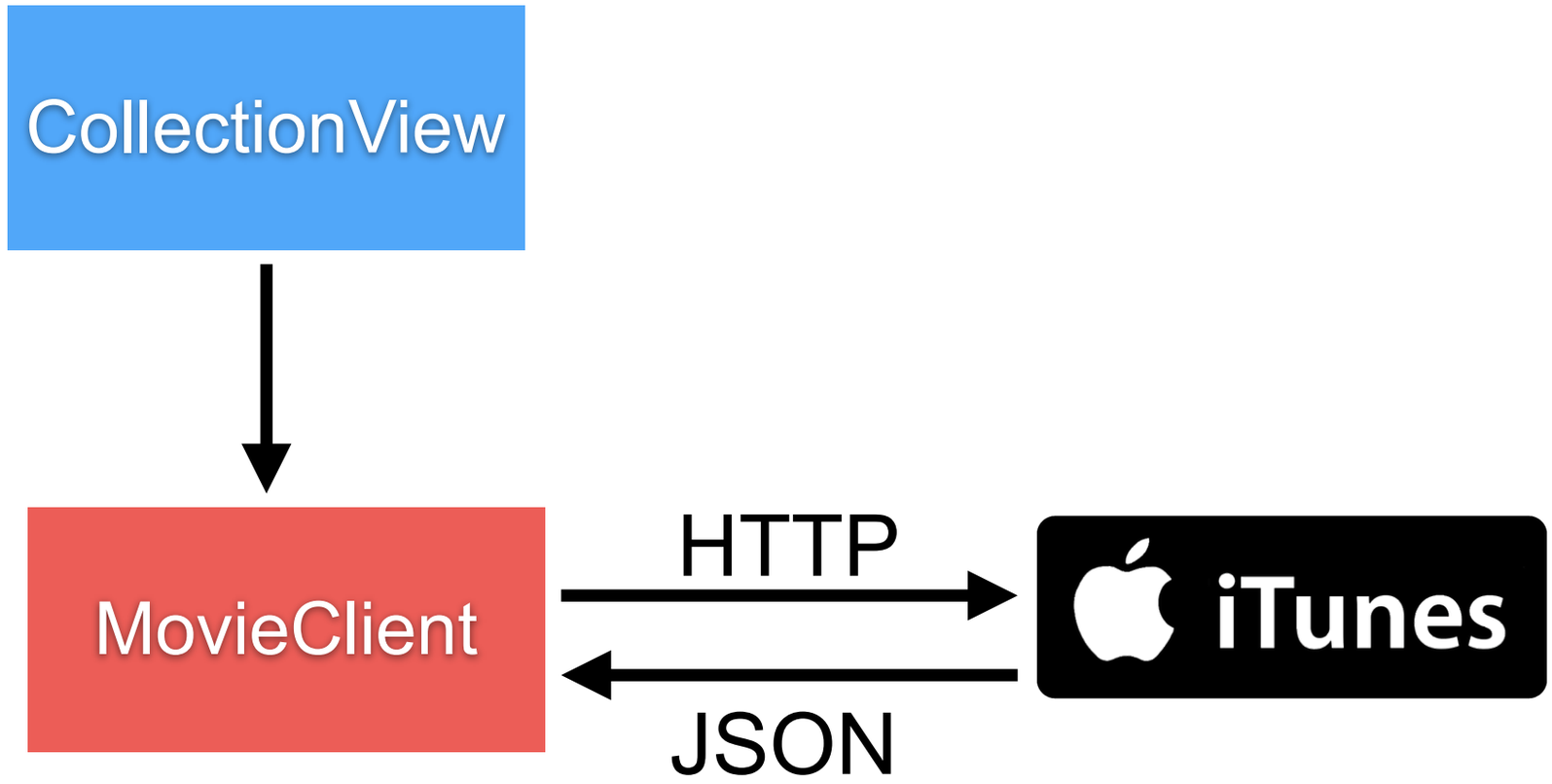
# Top movies page




https://itunes.apple.com/us/rss/topmovies/limit=50/json

# Top movies page



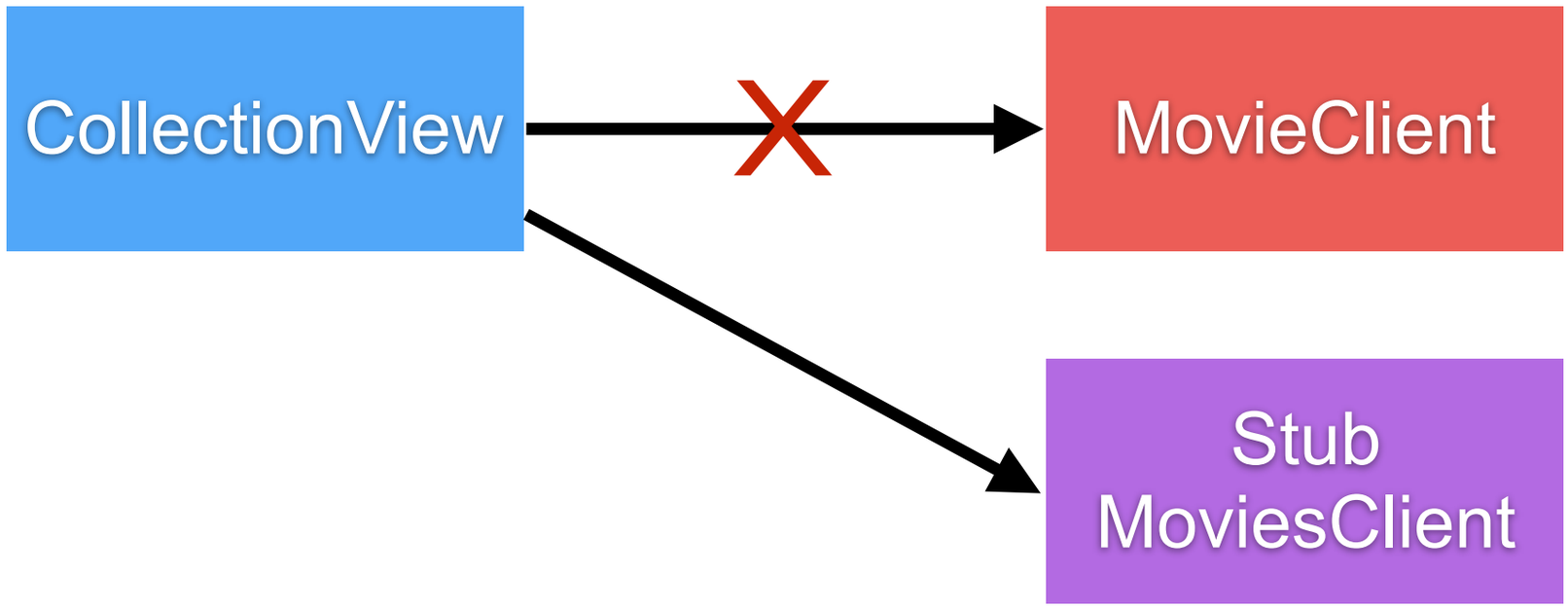



# Test cases ?

# Test cases ?

Title of page = **Top Movies**
Test the collection view
Working with APIs

# Manage dependency



# StubMoviesClient.swift

```
class StubMoviesClient: MoviesClient {
    var movies: [Movie]
    init(movies: [Movie]) {
        self.movies = movies
    }

    override func fetchMovies(completion: (([Movie]) -> Void)?) {
        completion!(movies)
    }
}
```

# Title of page = Top Movies

```
class MoviesViewControllerTests: XCTestCase {

    func moviesViewController(
        client: MoviesClient = StubMoviesClient(movies: []))
        -> MoviesViewController {

        let storyboard = UIStoryboard(name: "Main", bundle: nil)
        let vc = storyboard.instantiateViewController(withIdentifier: "Movies")
            as! MoviesViewController
        vc.moviesClient = client
        let _ = vc.view
        return vc

    }

    func test_title_is_Top_Movies() {
        let vc = moviesViewController()
        XCTAssertEqual(vc.navigationItem.title!, "Top Movies")
    }

}
```

# Test the collection view

No movies
2 movies
Collection view cell title name
Refresh when back to this page

# No movie to show

```
func test_collection_view_has_zero_items_when_there_are_no_movies() {
    let vc = moviesViewController()
    let numberOfItems = vc.collectionView(vc.collectionView,
        numberOfItemsInSection: 0)
    XCTAssertEqual(numberOfItems, 0)
}
```

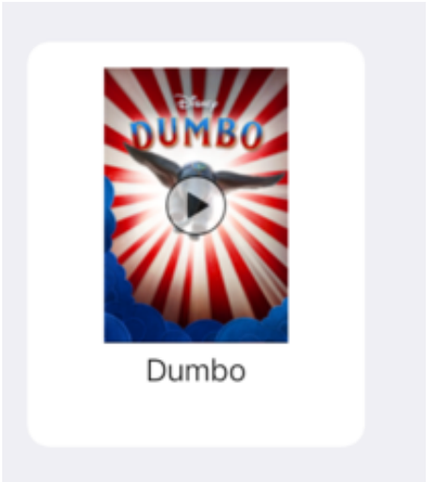
# 2 movies

```
func test_collection_view_has_two_items_when_there_are_two_movies() {
    let movies = [createMovie(), createMovie()]
    let vc = moviesViewController(client: StubMoviesClient(movies: movies))
    let numberOfItems = vc.collectionView(vc.collectionView,
        numberOfItemsInSection: 0)
    XCTAssertEqual(numberOfItems, 2)
}
```

```
func createMovie(title: String = "TEST") -> Movie {
    return Movie(title: title)
}
```

# Collection view cell title name

```
func test_first_cell_title_is_Jumanji_when_movie_is_Jumanji() {
    let movie = createMovie(title: "Jumanji: Welcome to the Jungle")
    let movies = [movie]
    let vc = moviesViewController(client: StubMoviesClient(movies: movies))

    let cell = vc.collectionView(vc.collectionView, cellForItemAt:
        IndexPath(row: 0, section: 0)) as! MovieCell

    XCTAssertEqual(movie.title, cell.title.text!)
}
```




# Refresh when back to this page

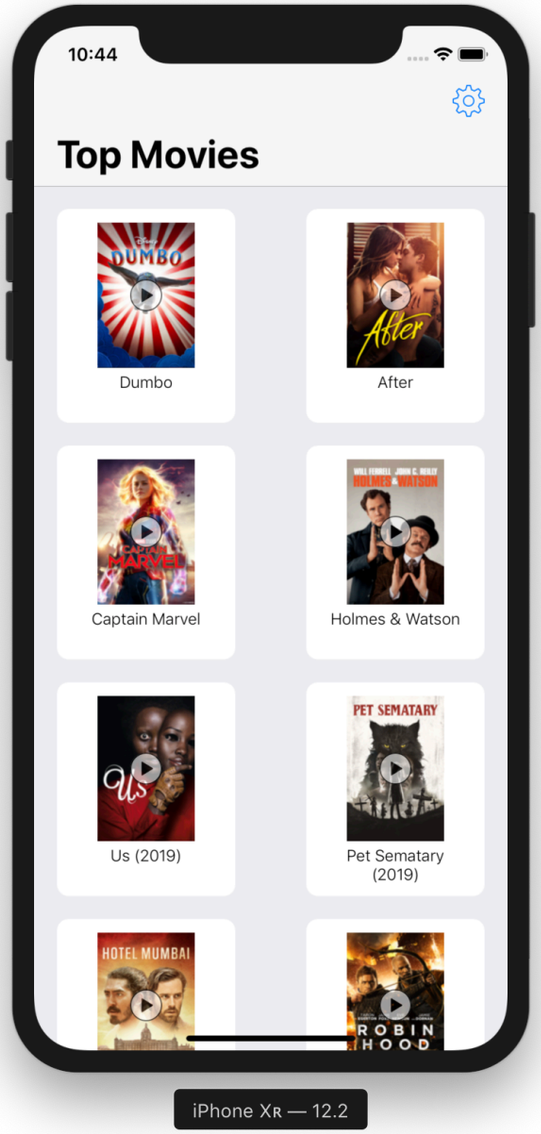
```
func test_movies_are_set_when_client_returns_movies() {
    let movies = [createMovie(), createMovie(), createMovie()]
    let vc = moviesViewController(client: StubMoviesClient(movies: movies))
    vc.refresh()
    XCTAssertEqual(vc.movies.count, 3)
}
```

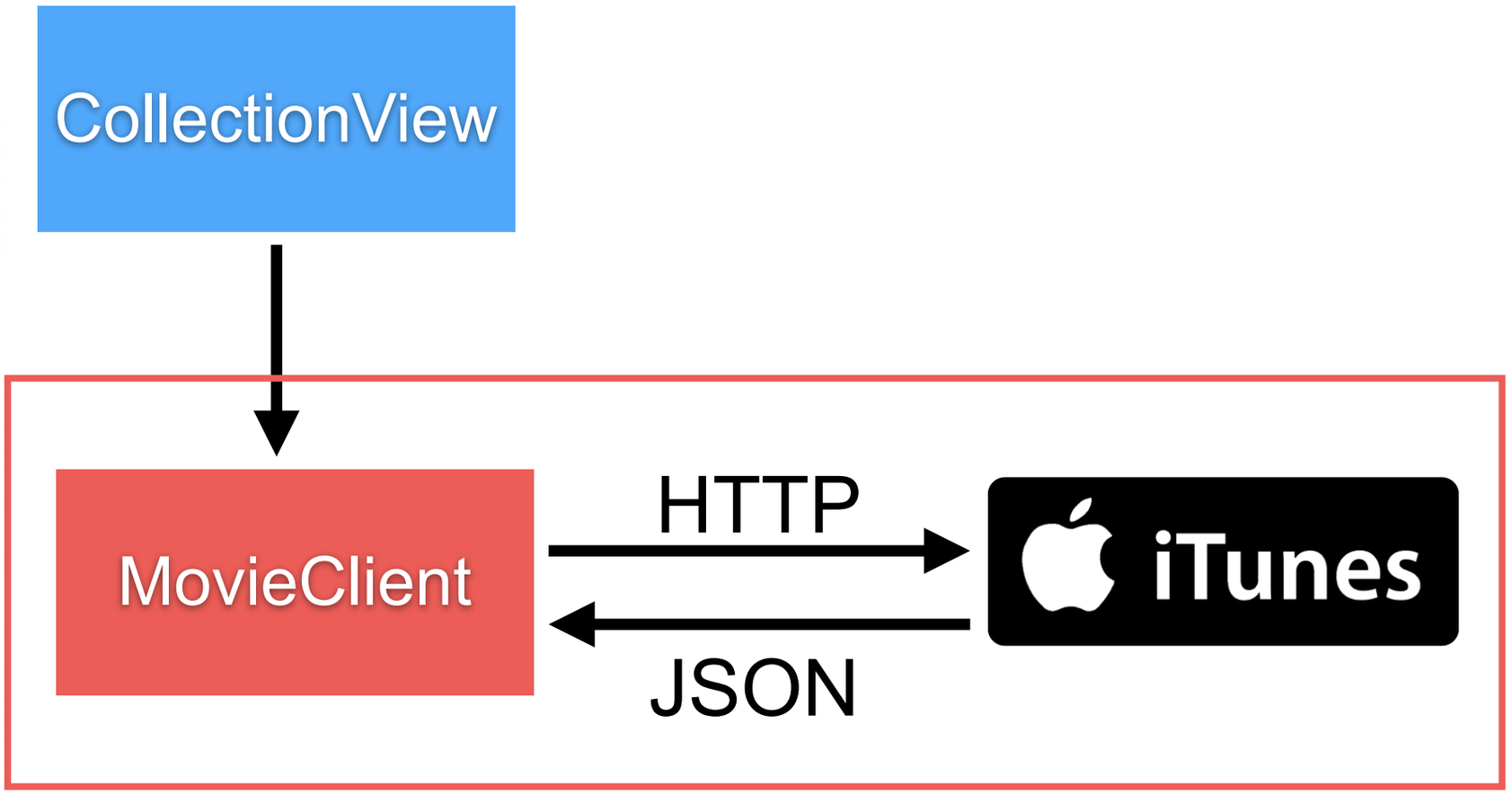
# Code coverage

| Name | Coverage | |
|---|---|---|
| TopMovies.app | | 49.4% |
| MoviesViewController.swift | | 71.1% |
| MyRandomNumber.swift | | 50.0% |
| MoviesParser.swift | | 0.0% |
| Movie.swift | | 14.7% |
| MoviesRouter.swift | | 100.0% |
| AppDelegate.swift | | 33.3% |
| SettingsViewController.swift | | 71.0% |
| MoviesClient.swift | | 39.7% |

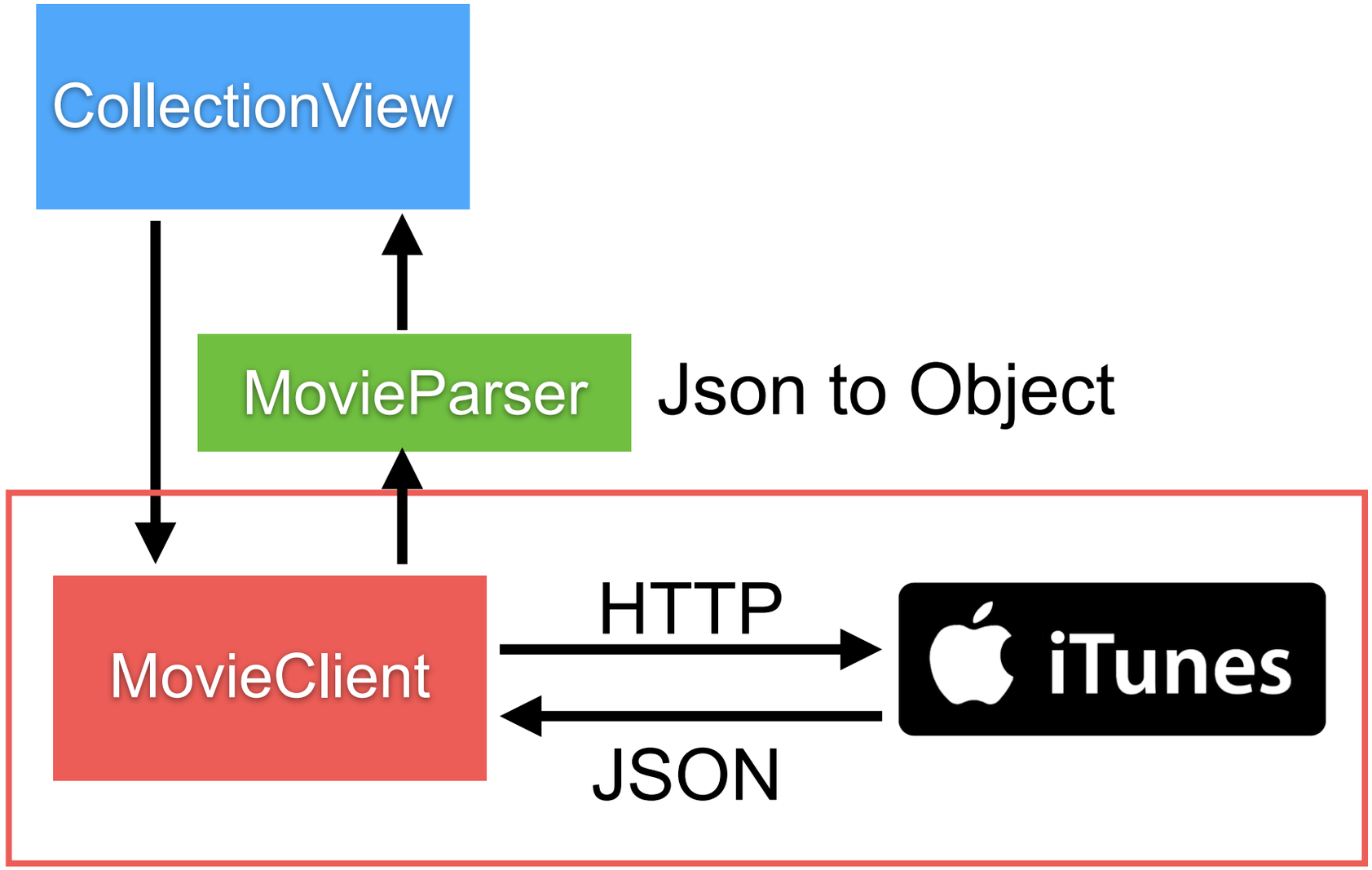
# Working with APIs

# Working with APIs



# Working with APIs



# Try with Stub

```
class MoviesClientTests: XCTestCase {

    func test_fetch_calls_completion() {
        let client = MoviesClient()
        client.router = StubMoviesRouter(limit: 6)
        let completionExpectation = expectation(description: "Fetch movies should call
            completion")
        client.fetchMovies { movies in
            completionExpectation.fulfill()
        }
        waitForExpectations(timeout: 5)
    }

}
```

```
class StubMoviesRouter: MoviesRouter {
    override func urlRequest() -> URLRequest {
        let url = URL(string: "http://10.105.147.41:8882/us/rss/topmovies/limit=6/json")!
        return URLRequest(url: url)
    }
}
```

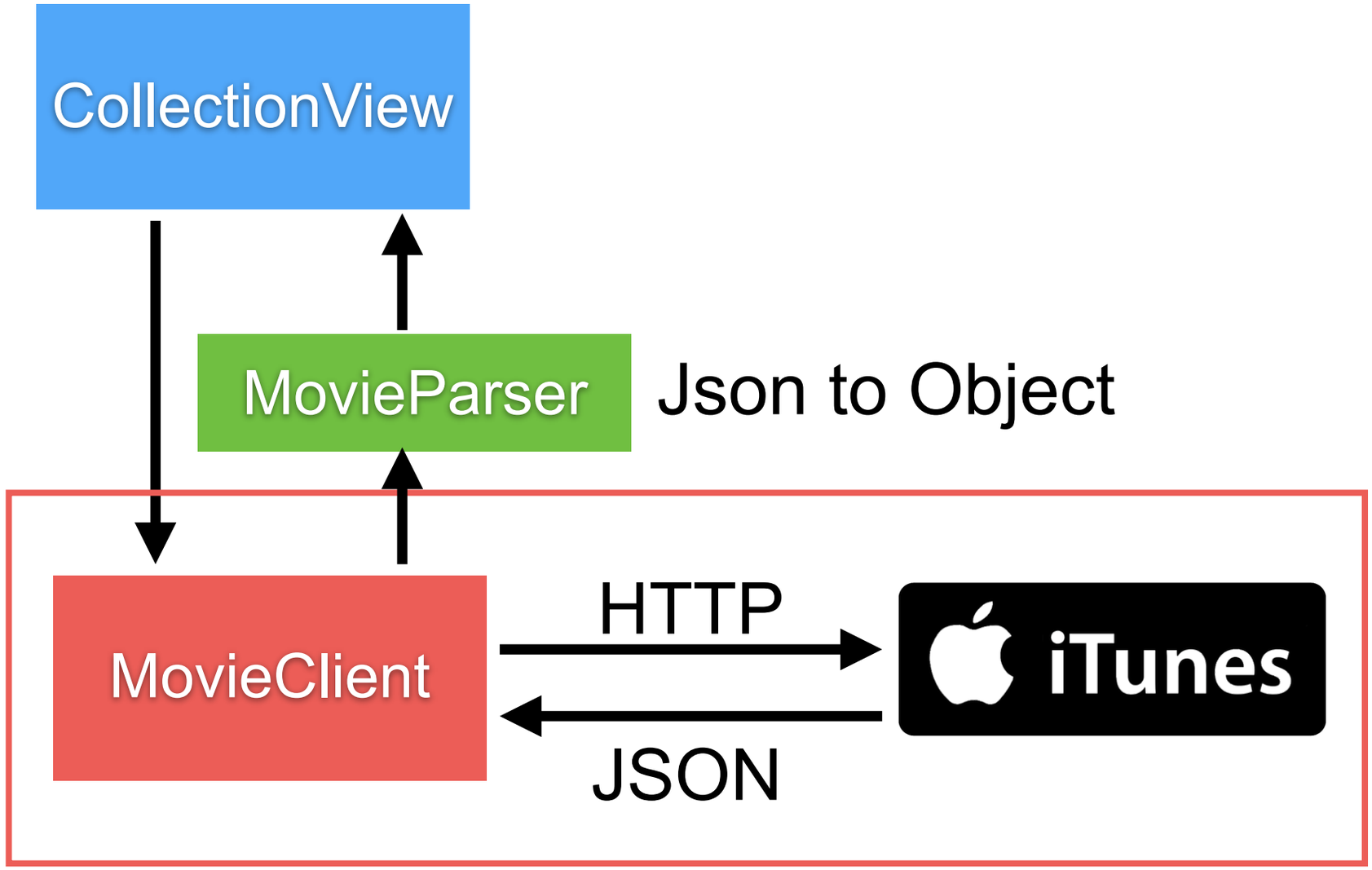
# Waiting for result (Asynchronous)

```
class MoviesClientTests: XCTestCase {

    func test_fetch_calls_completion() {
        let client = MoviesClient()
        client.router = StubMoviesRouter(limit: 6)
        let completionExpectation = expectation(description: "Fetch movies should call
            completion")
        client.fetchMovies { movies in
            completionExpectation.fulfill()
        }
        waitForExpectations(timeout: 5)
    }

}

class StubMoviesRouter: MoviesRouter {
    override func urlRequest() -> URLRequest {
        let url = URL(string: "http://10.105.147.41:8882/us/rss/topmovies/limit=6/json")!
        return URLRequest(url: url)
    }
}
```

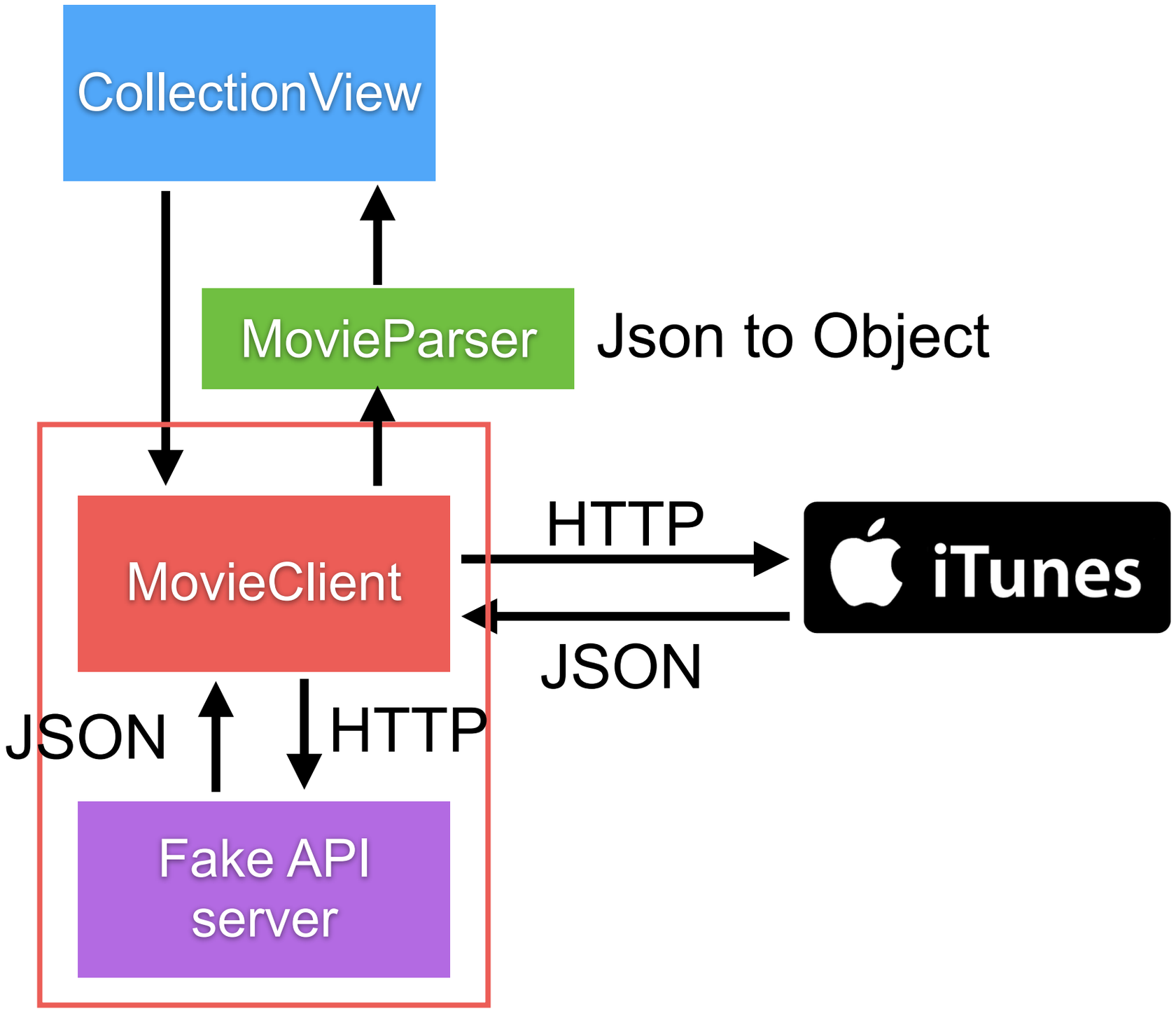
# Good or Bad ?

# UI Testing

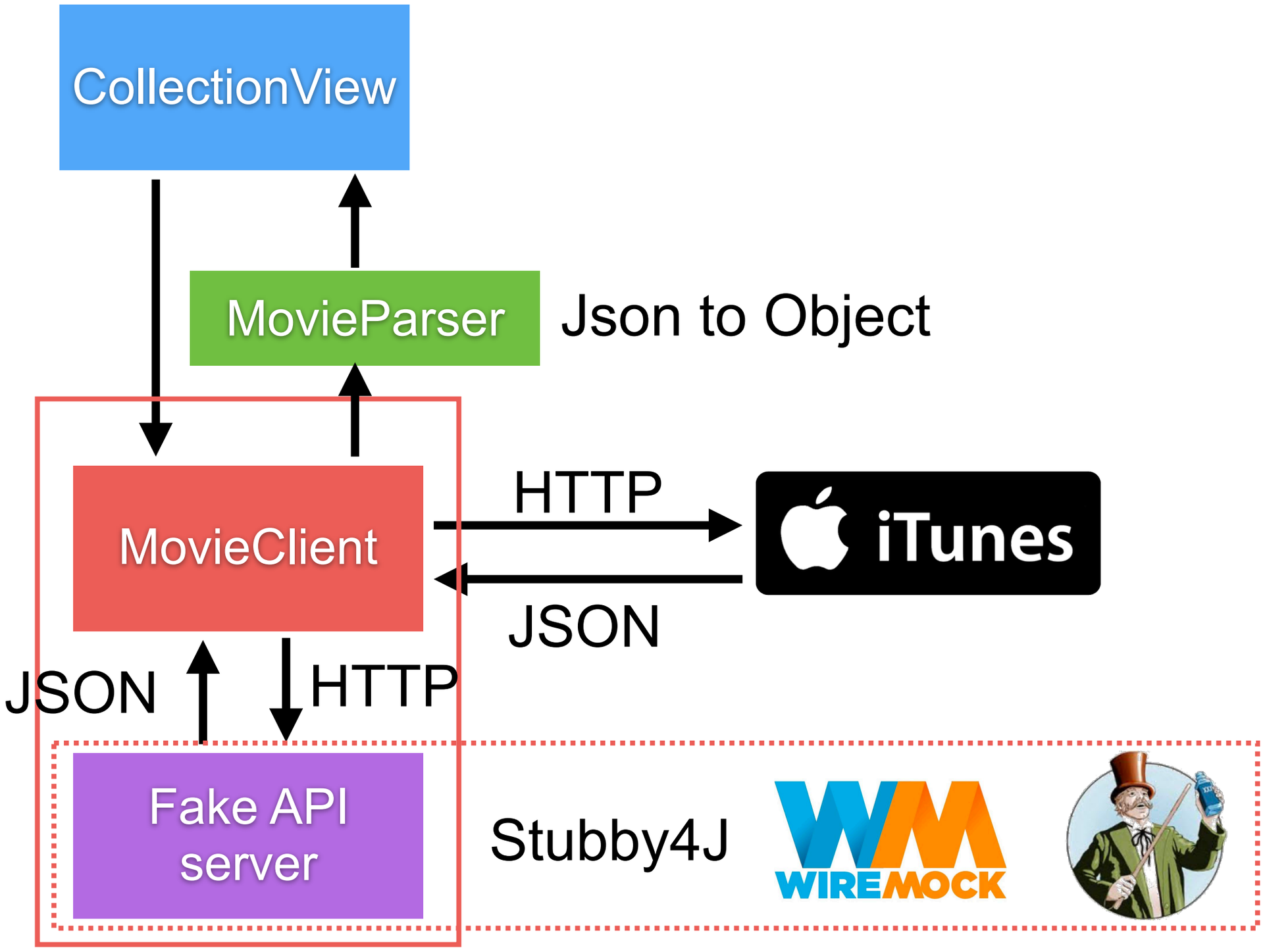
# Working with APIs



# Working with APIs



# Working with APIs



# Problem

# How to change URL of APIs from tests ?

# For iOS app

Active compilation + #if DEBUG

**Use Launch Environment from tests**

Custom page/ app for tests

# Start your Mock API Server

# Using Launch Environments from Tests

Easy to use but need more code !!

```
class TopMoviesUITests: XCTestCase {

    override func setUp() {
        continueAfterFailure = false
        let app = XCUIApplication()
        app.launchEnvironment["url"] =
            "http://192.168.1.33:8882/us/rss/topmovies/limit=6/json"
        app.launch()
    }

    func test_show_6_items() {
        let app = XCUIApplication()
        let collectionViewsQuery = app.collectionViews
        XCTAssertEqual(6, collectionViewsQuery.cells.count)
    }
```

# Write more production code

## To check data from tests

```
class MoviesRouter {
    var limit: Int

    init(limit: Int) {
        self.limit = limit
    }

    func urlRequest() -> URLRequest {
        if let fromTest = ProcessInfo.processInfo.environment["url"].self {
            let url = URL(string: fromTest)!
            return URLRequest(url: url)
        }
        let url = URL(string:
            "https://itunes.apple.com/us/rss/topmovies/limit=\(limit)/json")!
        return URLRequest(url: url)
    }
}
```

# Code coverage

| Name | Coverage |
| --- | --- |
| TopMovies.app | 75.9% |
| MyRandomNumber.swift | 50.0% |
| MoviesViewController.swift | 71.1% |
| MoviesParser.swift | 66.7% |
| Movie.swift | 91.2% |
| SettingsViewController.swift | 71.0% |
| AppDelegate.swift | 33.3% |
| MoviesRouter.swift | 100.0% |
| MoviesClient.swift | 91.4% |

# Add more tests by yourself

# Working with fastlane

# Fastlane

Scan
Snapshot

# Install Fastlane

$gem install fastlane

# Using scan

$fastlane scan init

# Scanfile

$fastlane scan

```
scheme("TopMovies")
open_report(true)
clean(true)
skip_build(true)
```

# Scan result

$fastlane scan

```
+-----------------------+-----+
|      Test Results             |
+-----------------------+-----+
| Number of tests       | 12  |
| Number of failures    | 0   |
+-----------------------+-----+
```

# Scan result in ./test_output

## $fastlane scan

Test Results

12 tests | All | Failing | Passing

| TopMoviesTests.MyRandomNumberTest | |
|---|---|
| 0.001s | test_random_number_5 |
| 0.000s | test_random_number_more_than_10 |
| 0.000s | test_random_should_called_get_1_time |

| TopMoviesTests.SettingsTests | |
|---|---|
| 0.006s | test_setting_error_message_should_not_display |
| 0.004s | test_setting_input_1_should_error_display |
| 0.003s | test_setting_input_201_should_error_display |
| 0.007s | test_setting_input_2_should_error_not_display |
| 0.003s | test_setting_input_2x_should_error_display |
| 0.003s | test_setting_input_2x_should_error_message |
| 0.003s | test_setting_label_should_display |
| 0.003s | test_setting_number_should_placeholder_50 |
| 0.003s | test_setting_title_page_should_Settings |

Report generated with xcpretty

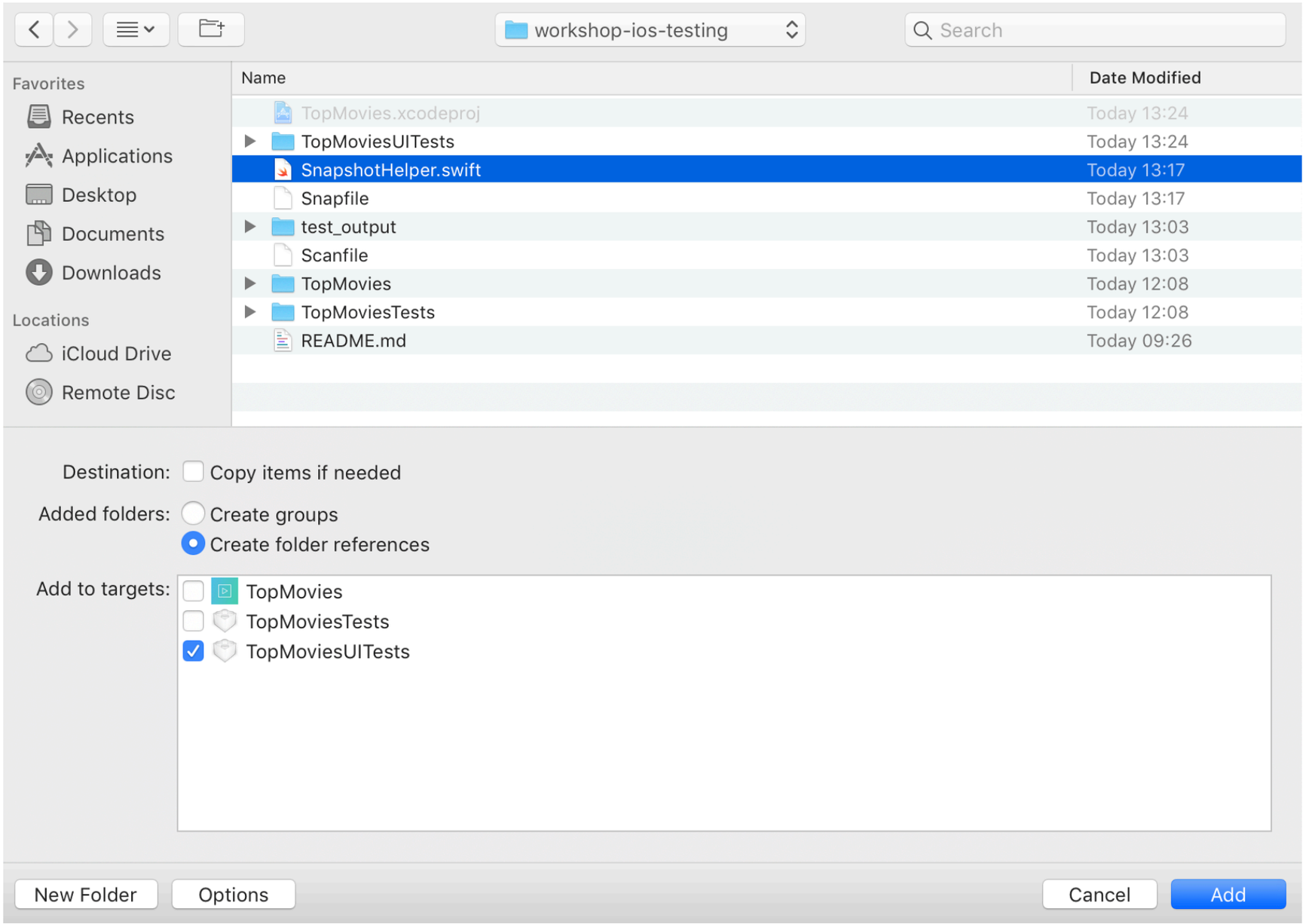
# Using snapshot

## $fastlane snapshot init

```
[✔] 🚀
✅  Successfully created SnapshotHelper.swift './SnapshotHelper.swift'
✅  Successfully created new Snapfile at './Snapfile'
------------------------------------------------------
Open your Xcode project and make sure to do the following:
1) Add a new UI Test target to your project
2) Add the ./fastlane/SnapshotHelper.swift to your UI Test target
   You can move the file anywhere you want
3) Call `setupSnapshot(app)` when launching your app

  let app = XCUIApplication()
  setupSnapshot(app)
  app.launch()

4) Add `snapshot("0Launch")` to wherever you want to trigger screenshots
5) Add a new Xcode scheme for the newly created UITest target
6) Add a Check to enable the `Shared` box of the newly created scheme
```

# Add SnapshotHelper.swift

## To UITest Target



# Add in test cases

```
class TopMoviesUITests: XCTestCase {

    override func setUp() {
        continueAfterFailure = false
        let app = XCUIApplication()
        setupSnapshot(app)
        app.launch()
    }

    func testExample() {
        snapshot("Step 01")
        snapshot("Step 02")
        snapshot("Step 03")
    }

}
```

# Using snapshot

$fastlane snapshot