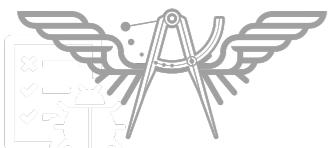


Mobile Automated Testing with Appium



Automated Testing



<https://appium.io/docs/en/latest/>



**[https://github.com/up1/
course-appium-robotframework](https://github.com/up1/course-appium-robotframework)**



Topics

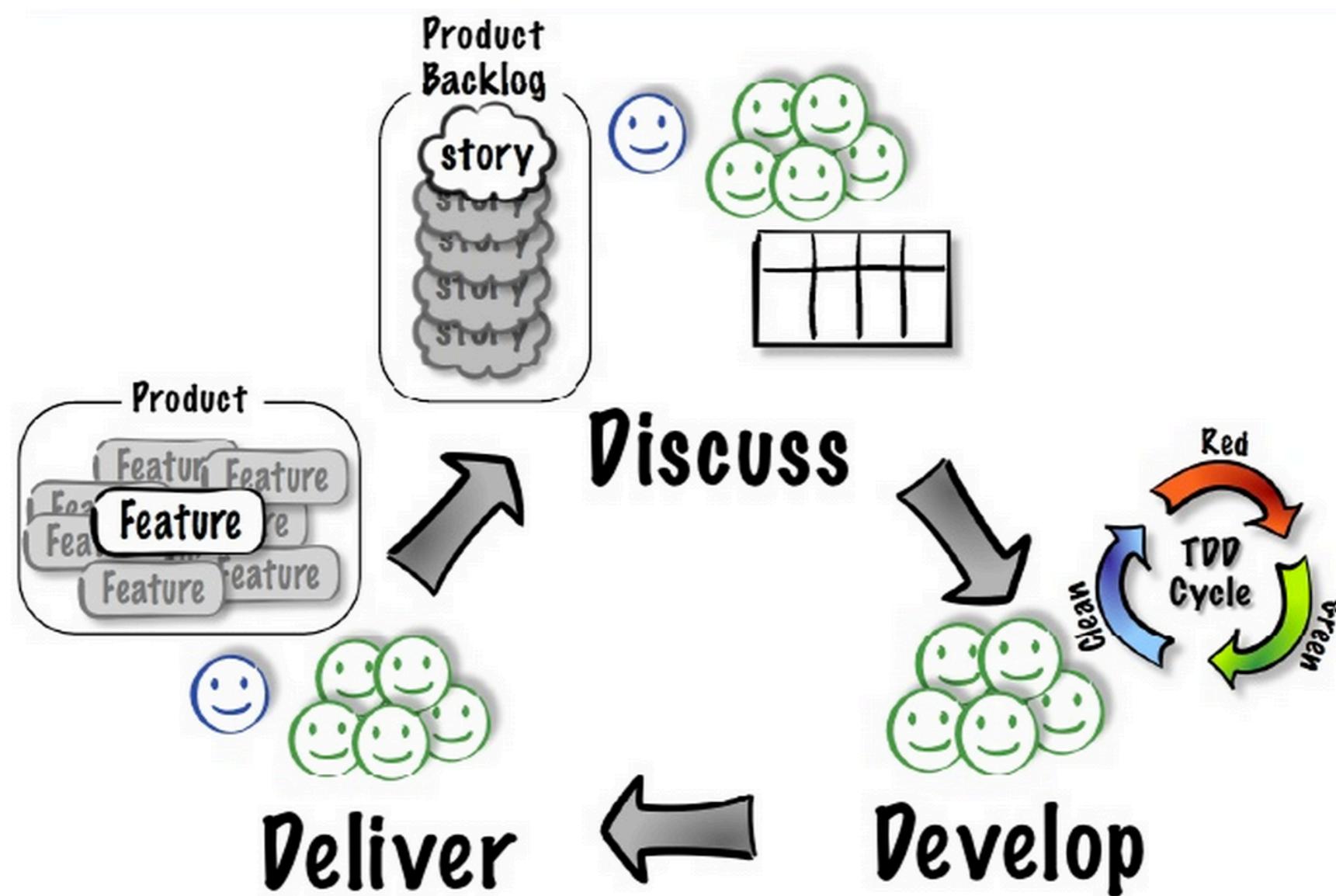
Think about Test !!
Mobile testing strategies
Introduction to Appium
Working with Android, iOS and Flutter app
Write test cases
Tips and techniques



THINK before coding



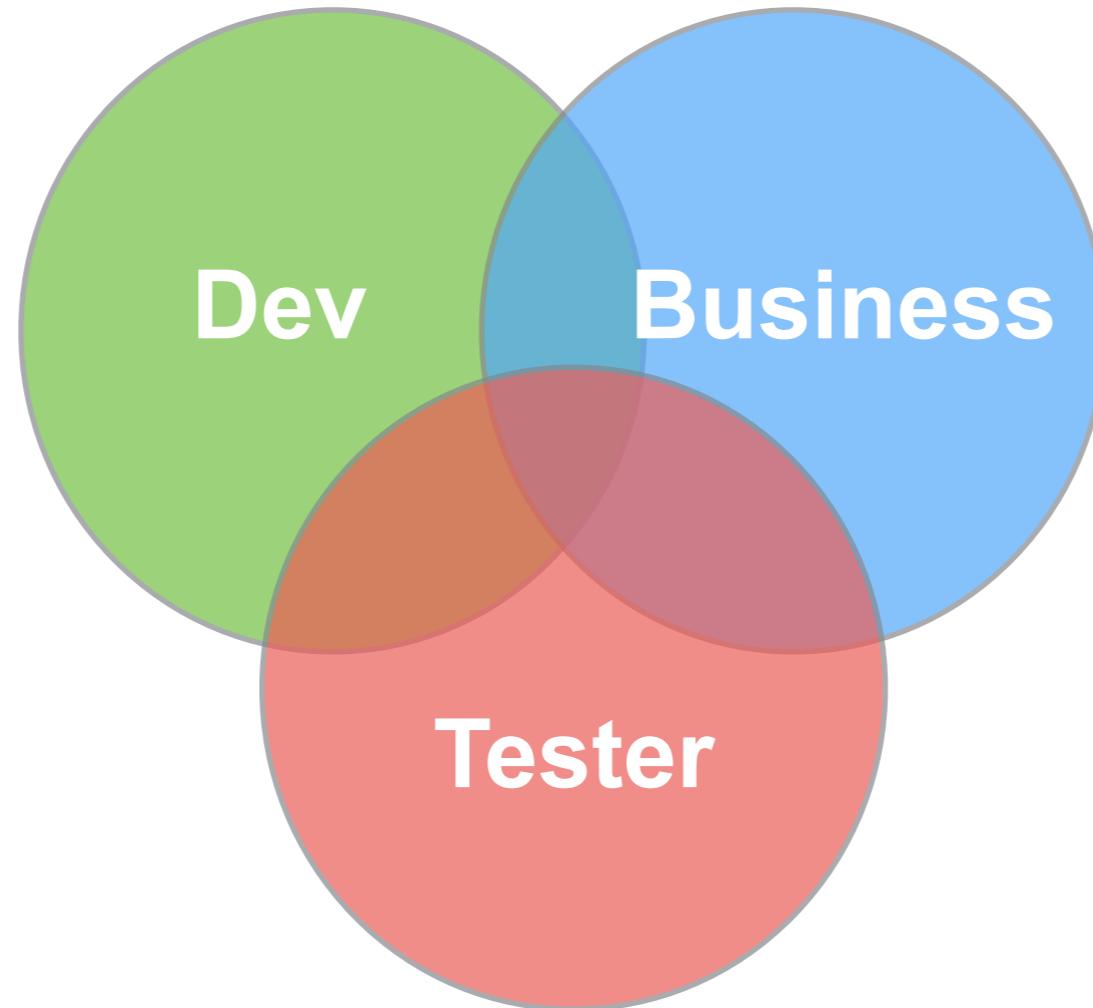
Acceptance Test-Driven Development



(Model developed with Pekka Klärck, Bas Vodde, and Craig Larman.)



Acceptance Test-Driven Development



Acceptance Tests

=

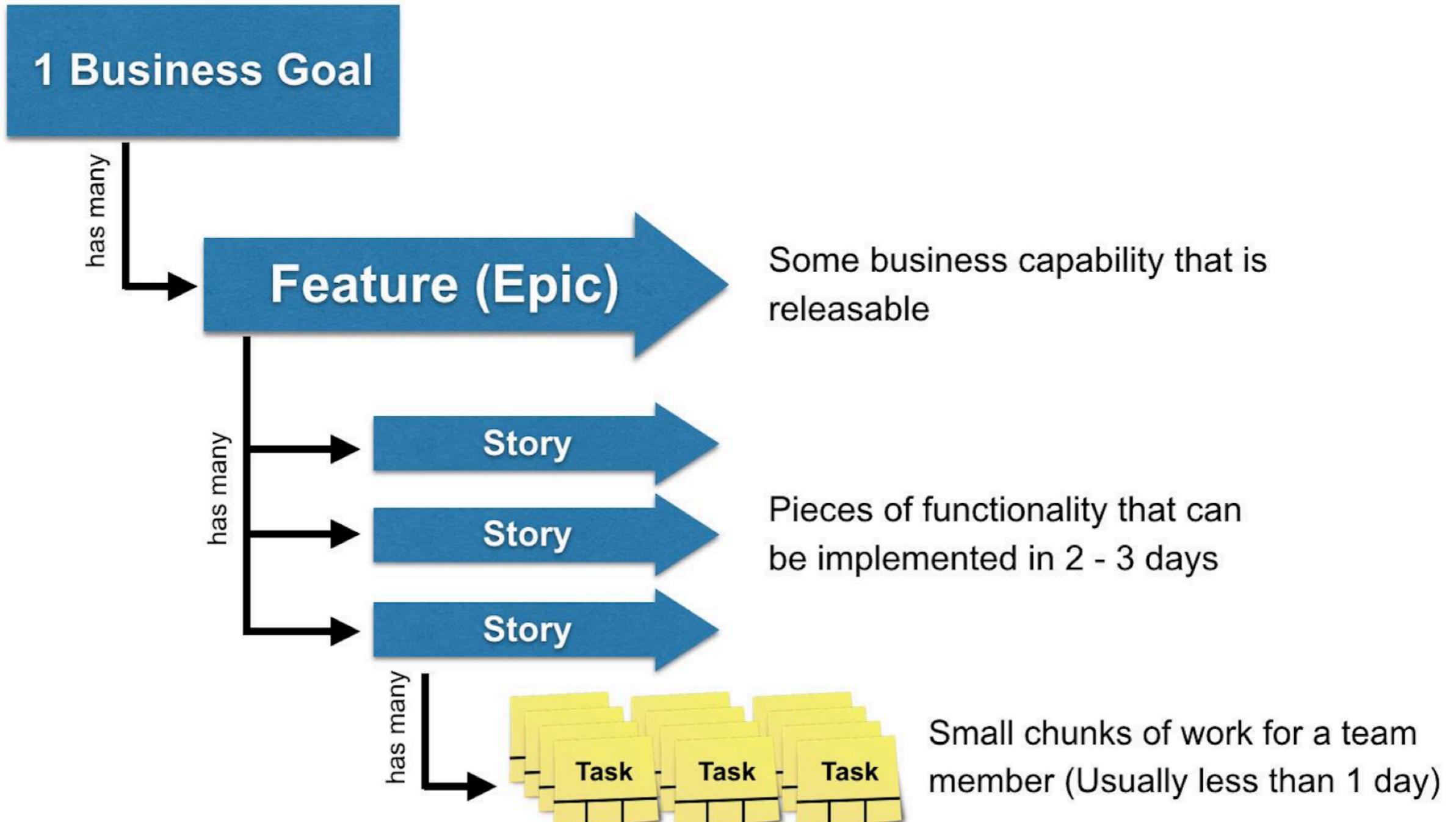
Business Criteria

+

Examples (data)



Work break down



Iterative and incremental process

Feature 1

Time



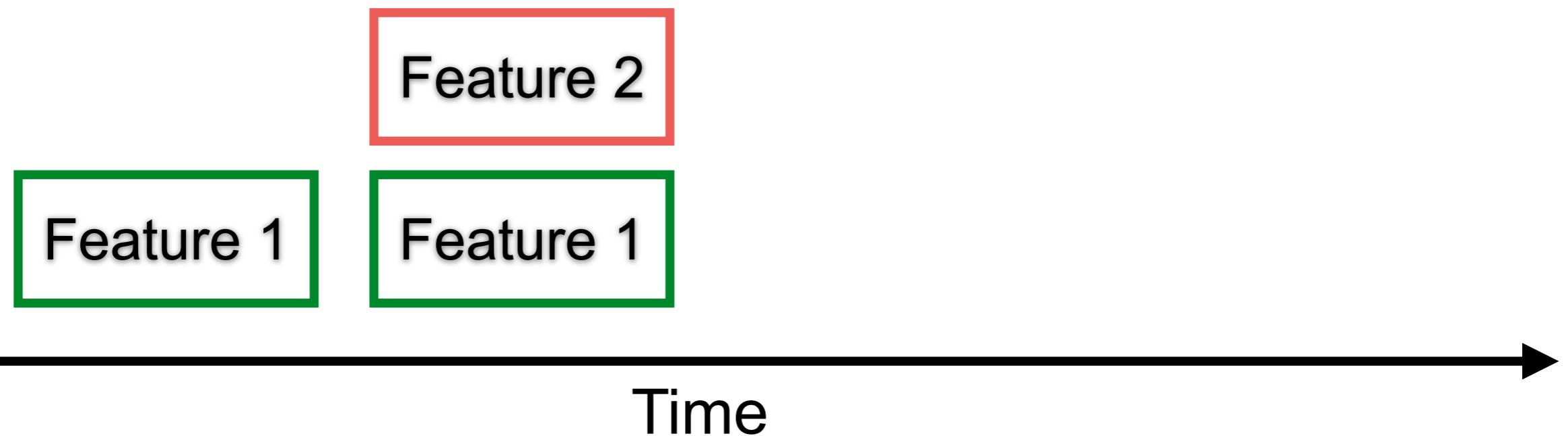
Iterative and incremental process

Done = coded and tested



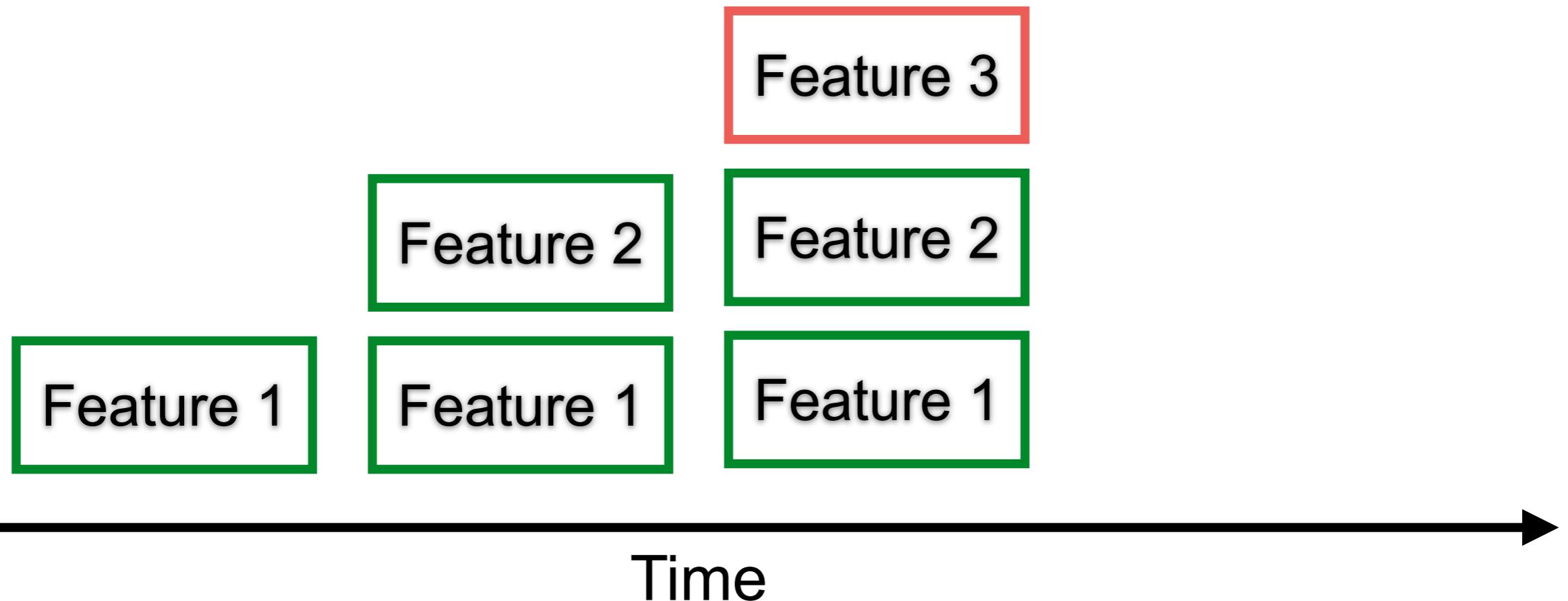
Iterative and incremental process

Done = coded and tested



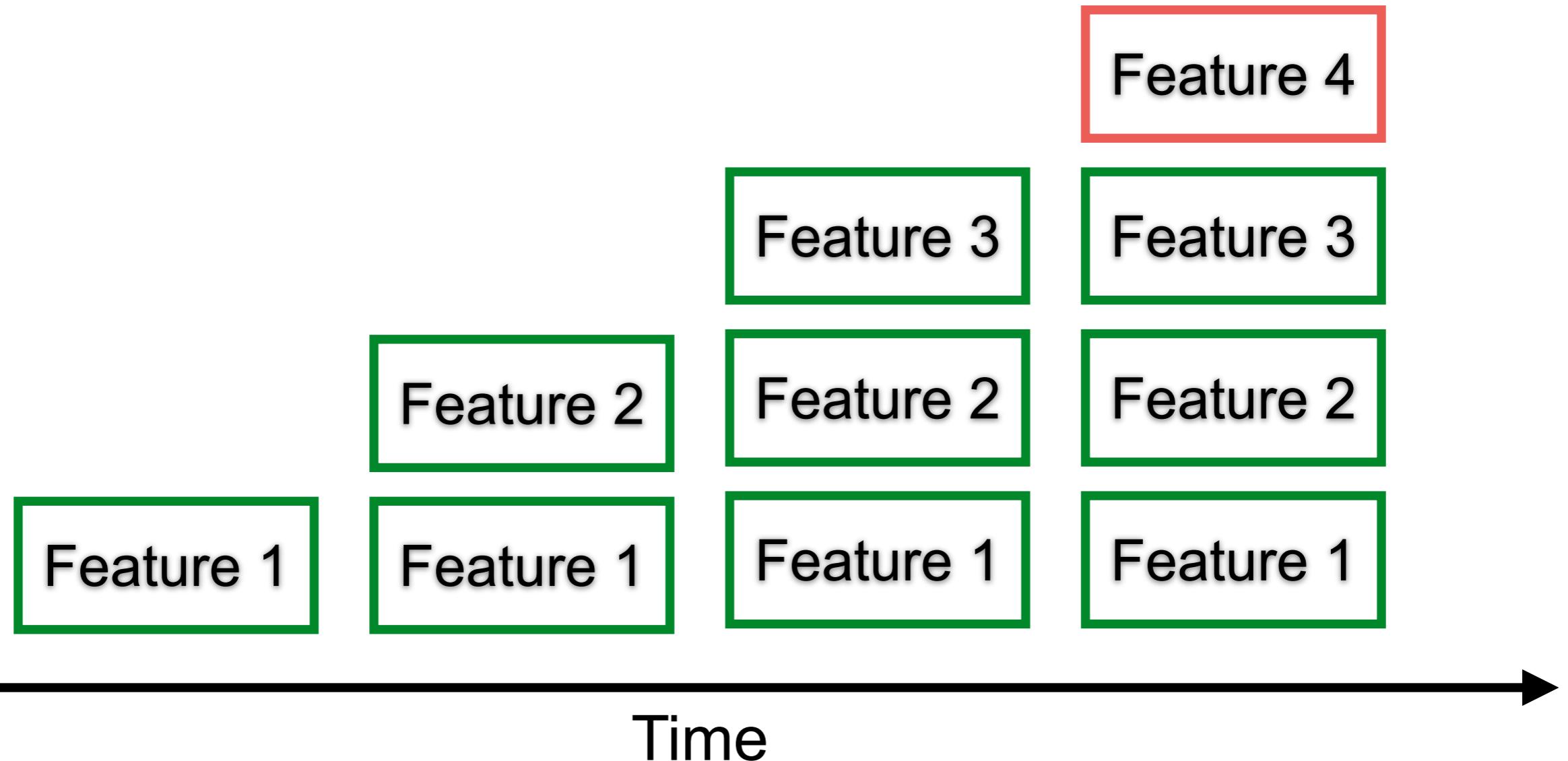
Iterative and incremental process

Done = coded and tested



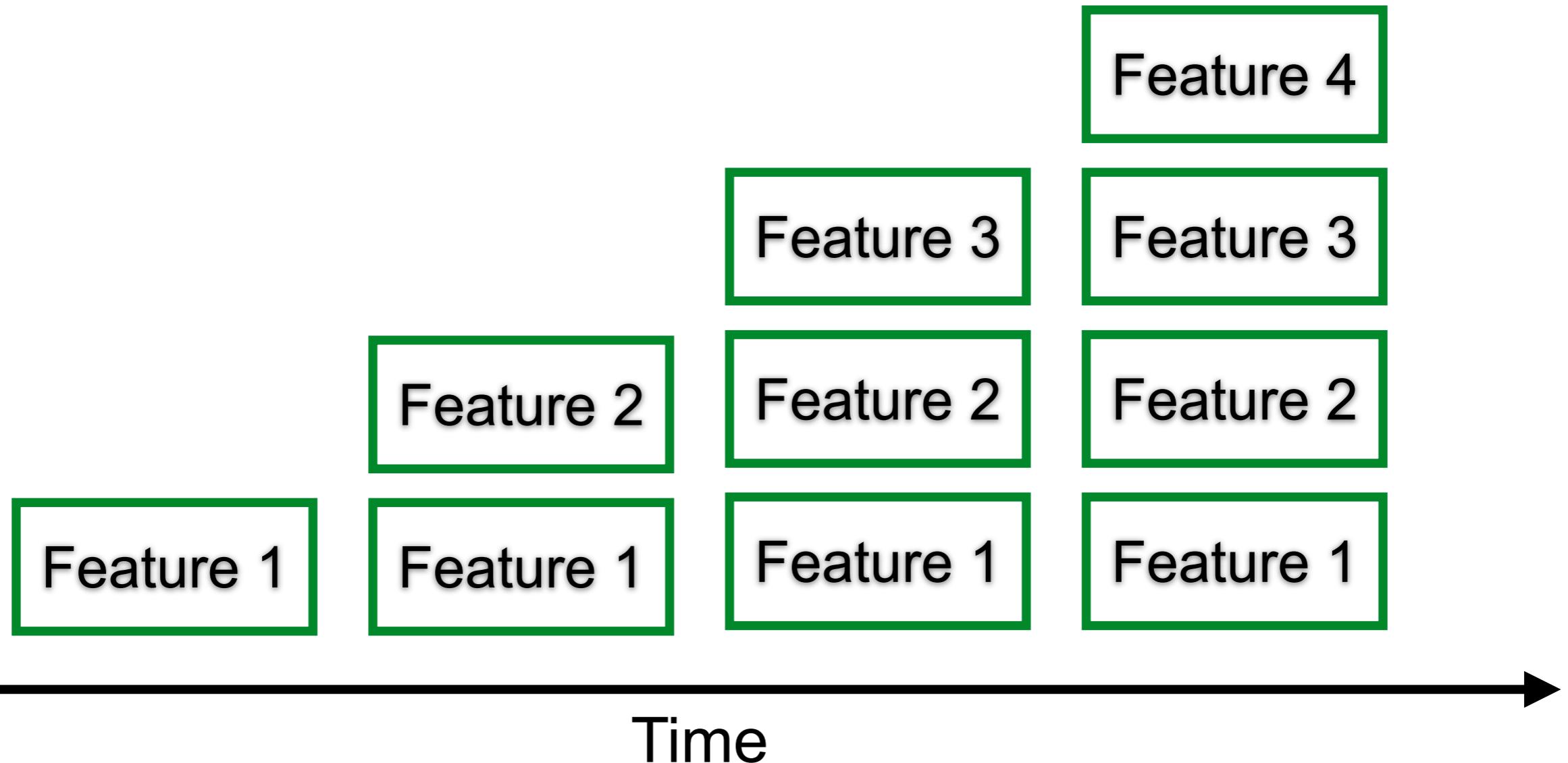
Iterative and incremental process

Done = coded and tested



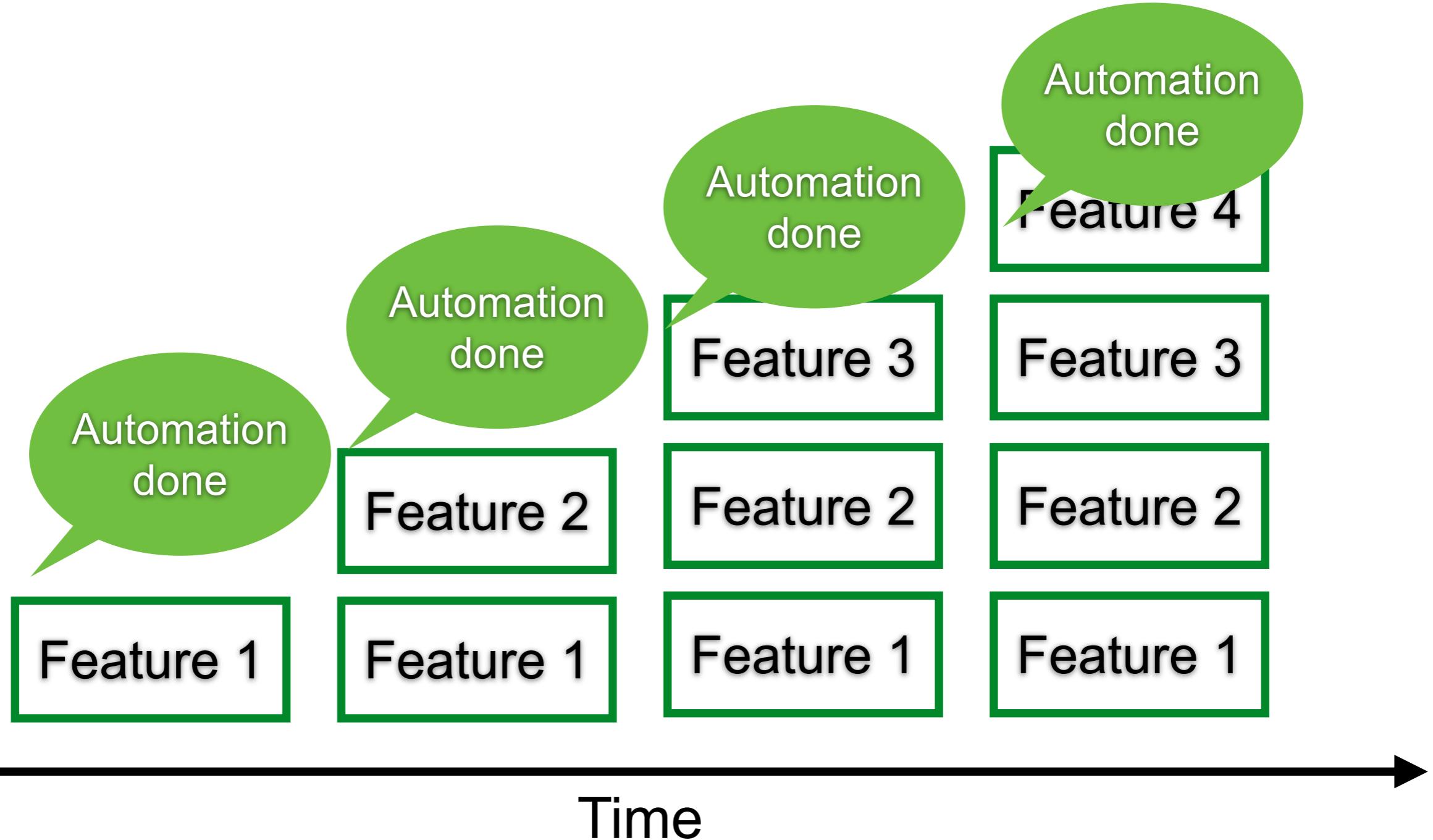
Iterative and incremental process

Done = coded and tested



Iterative and incremental process

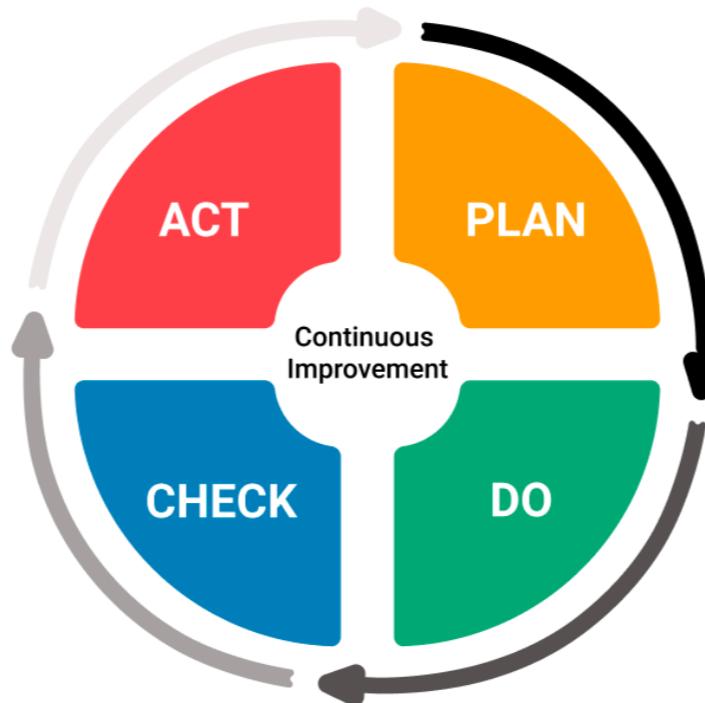
Done = coded and tested



Automation feedback

Easier over time ?

Time spent on maintenance ?
Test find regression bugs ?



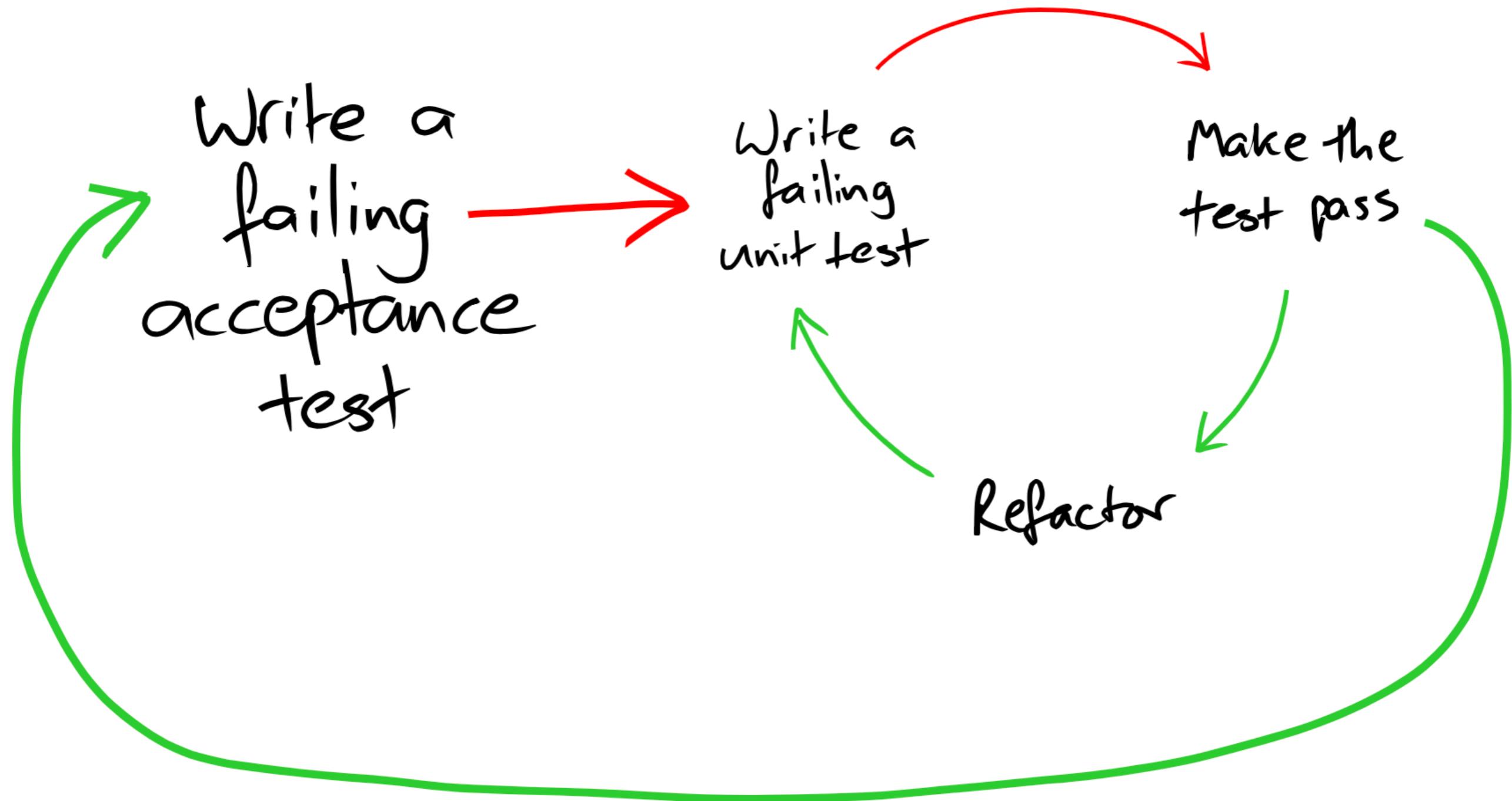
Start with simple



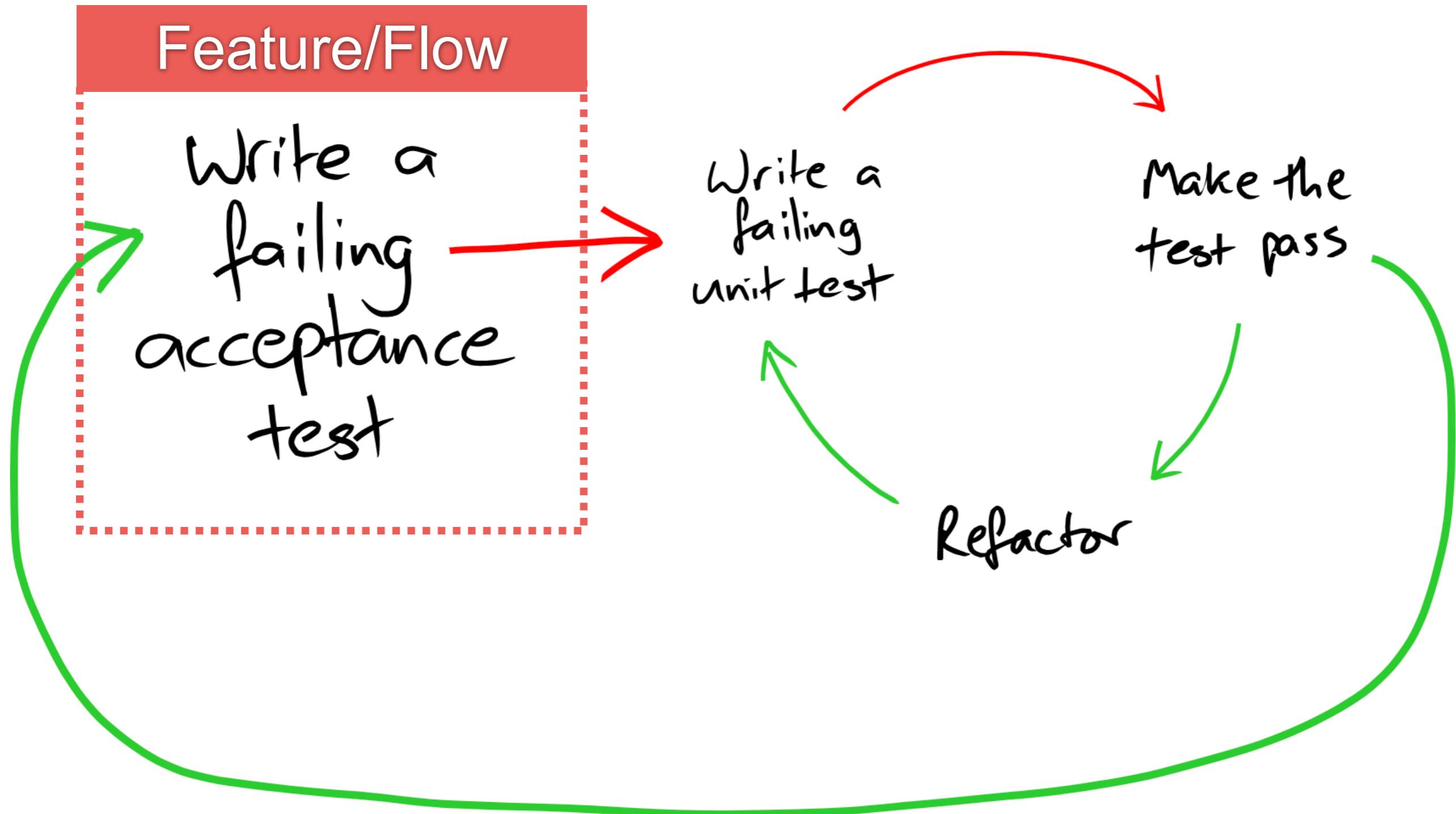
Use **feedback** to improve



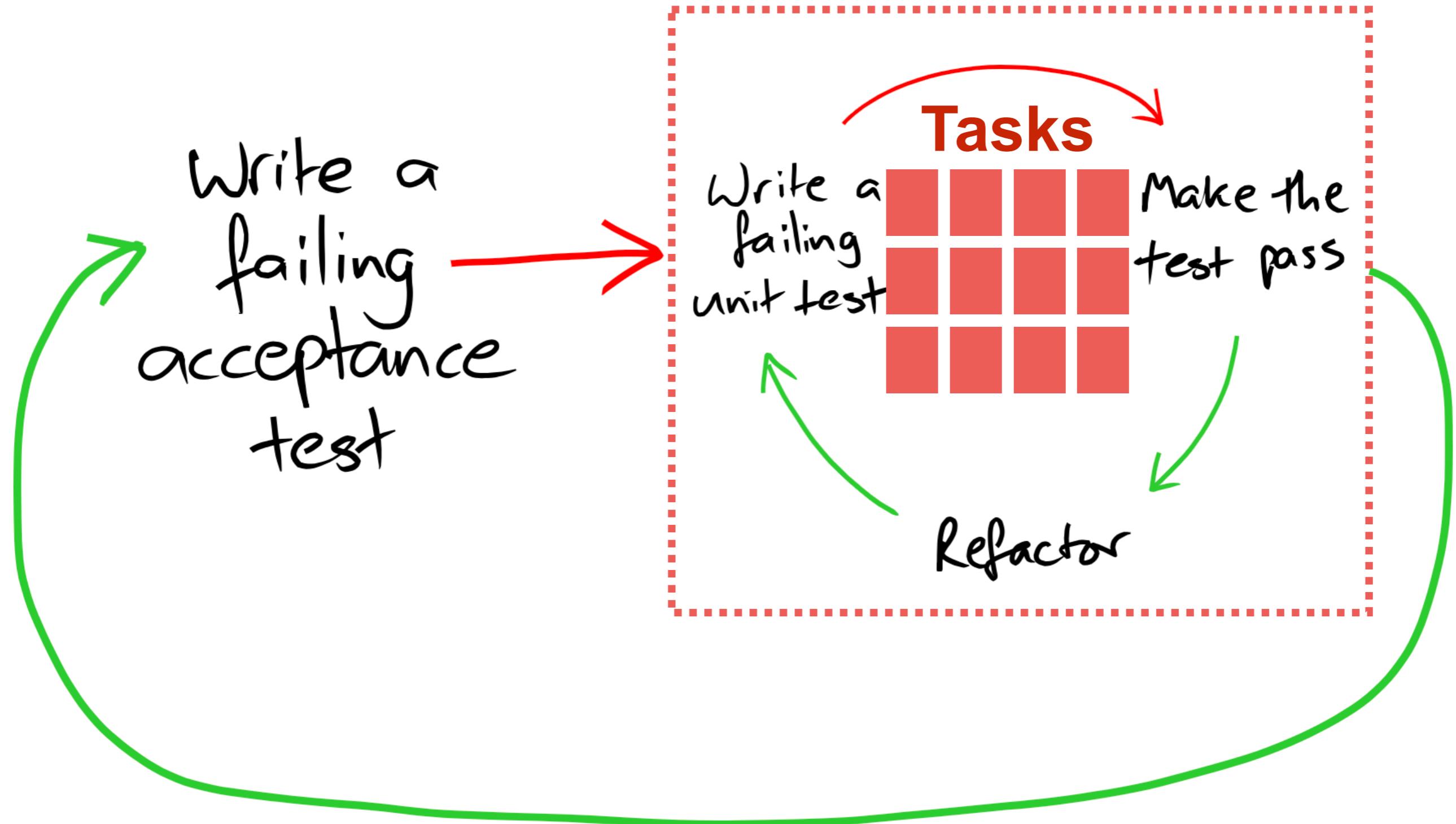
Outside-in develop/test



Outside-in develop/test



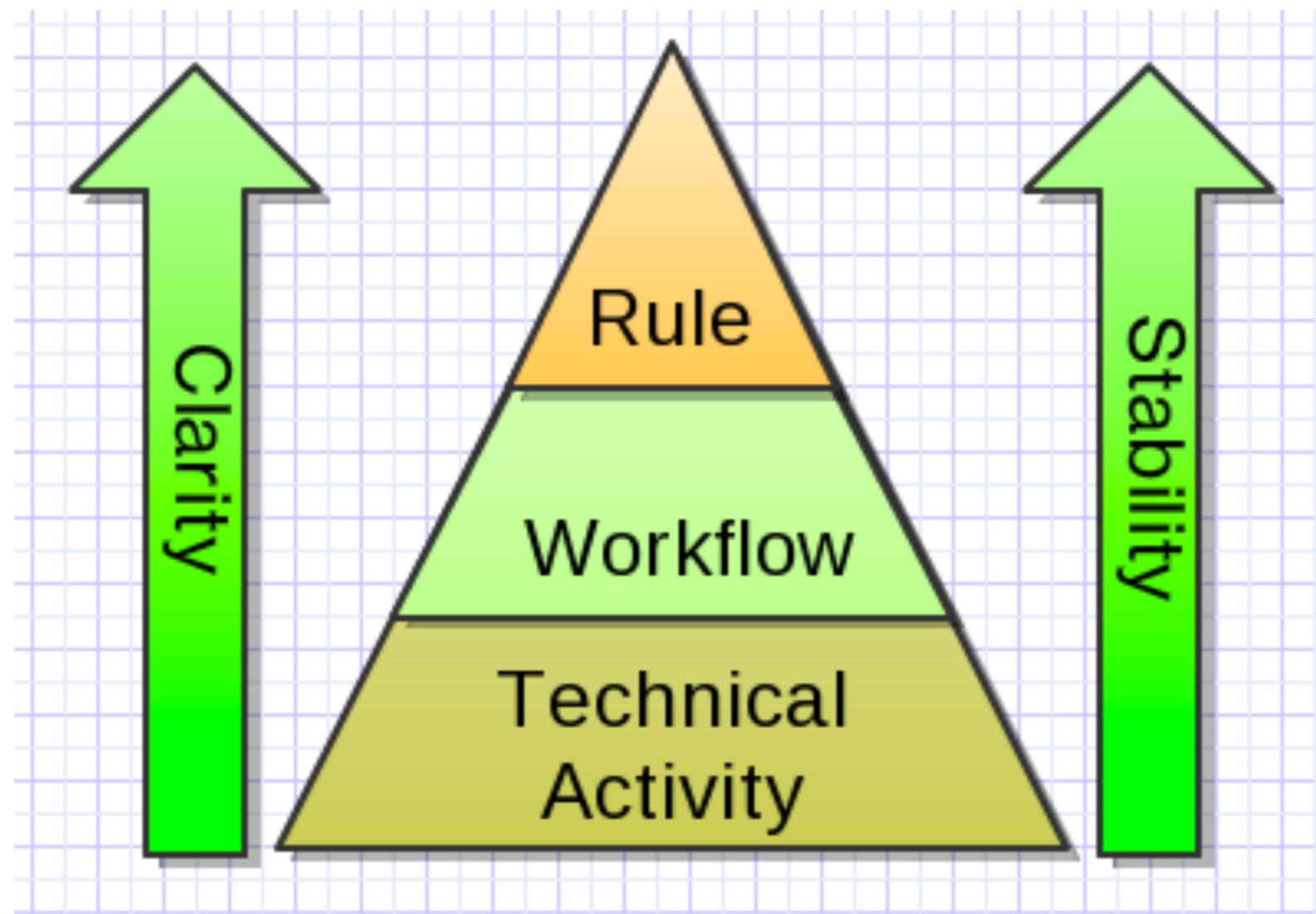
Outside-in develop/test



UI Test Automation



3 levels of UI test automation



3 levels of UI test automation

Business rule/functionality level

what is this test demonstrating or exercising

User interface workflow level

what does a user have to do to exercise the functionality through the UI

Technical activity level

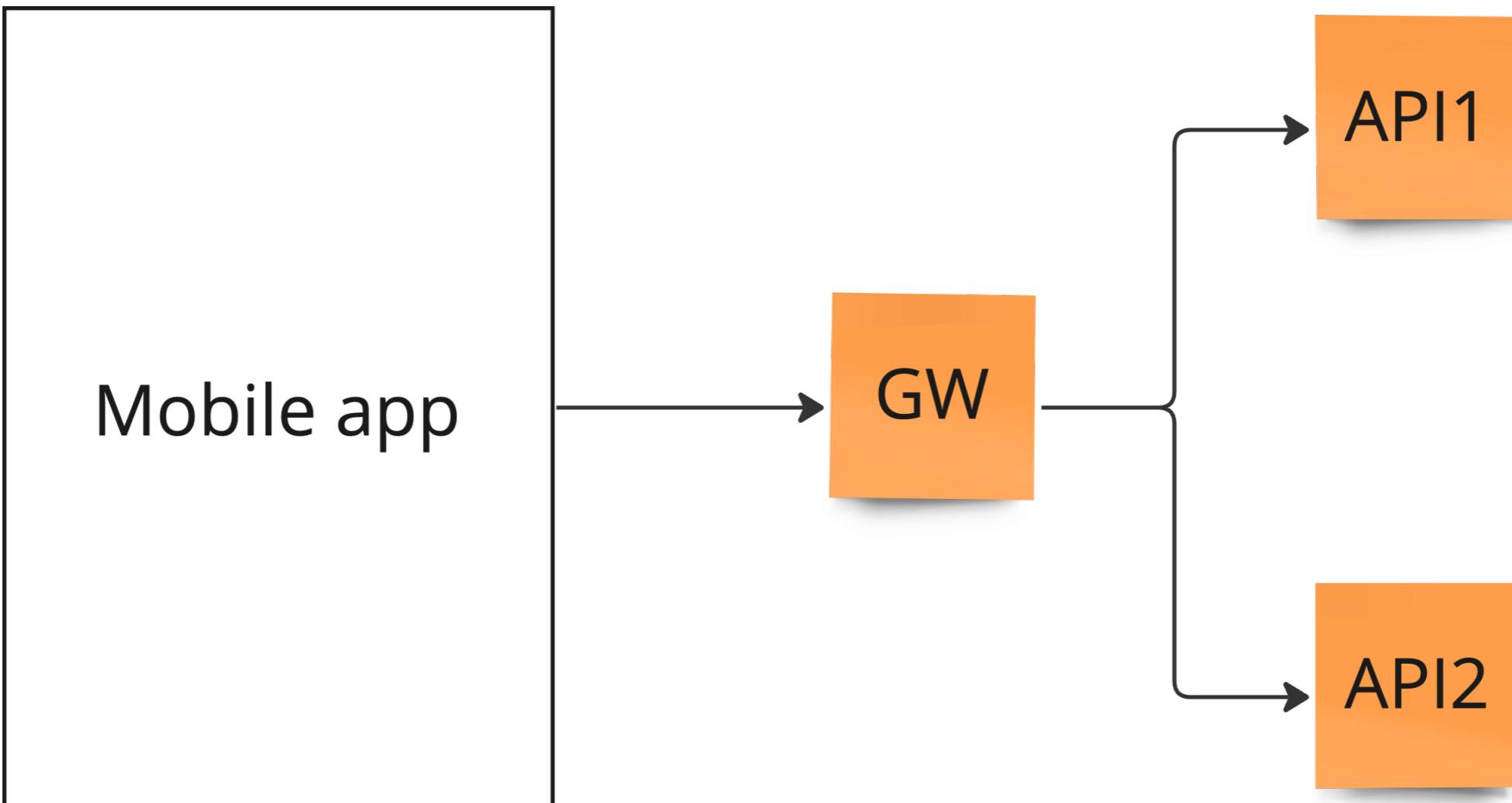
what are the technical steps required to exercise the functionality



Architecture !!



Architecture of System



Test strategy ?

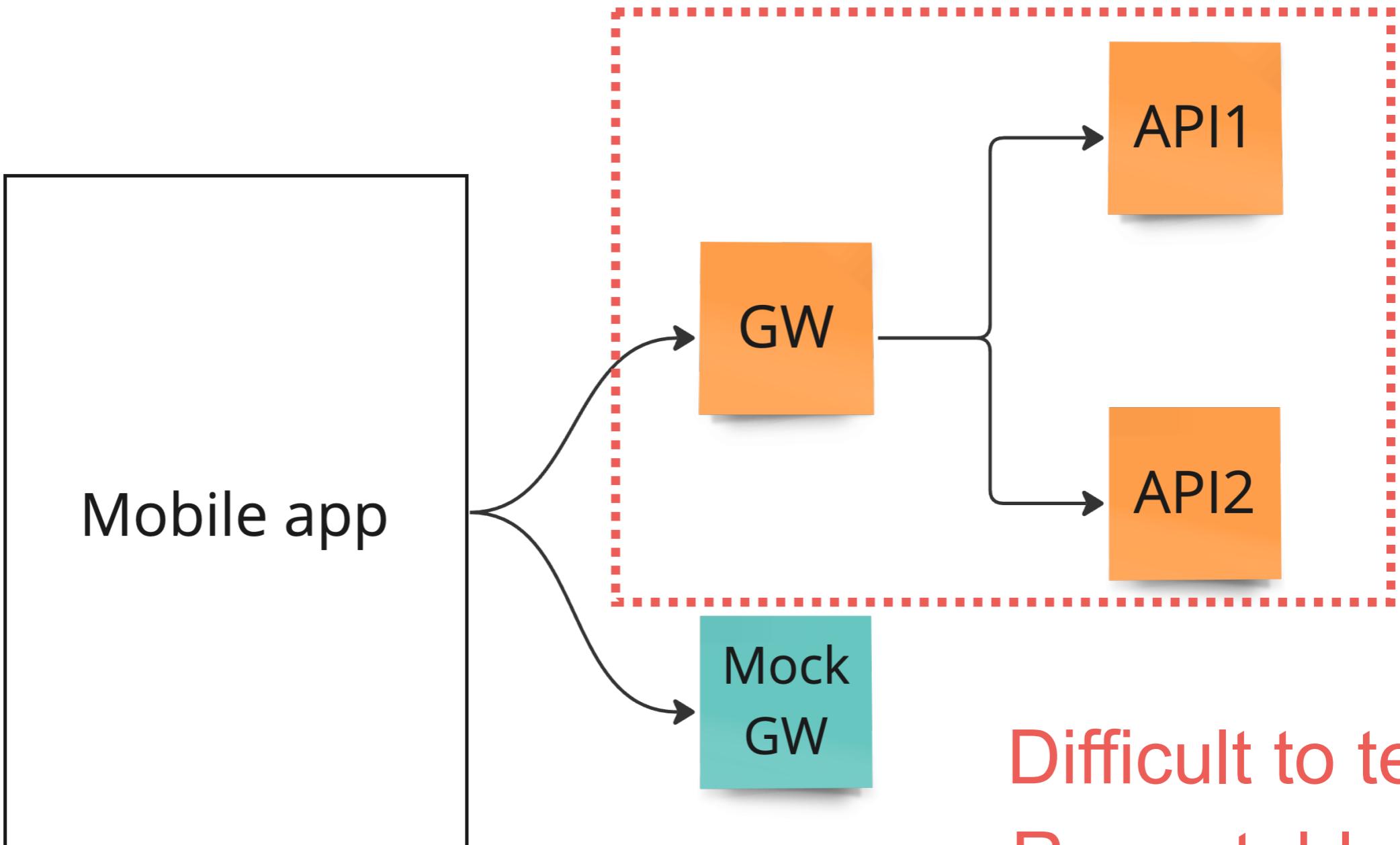


Good Tests ?

Fast
Isolate
Repeatable
Self-verify
Timely and Through
Understandable



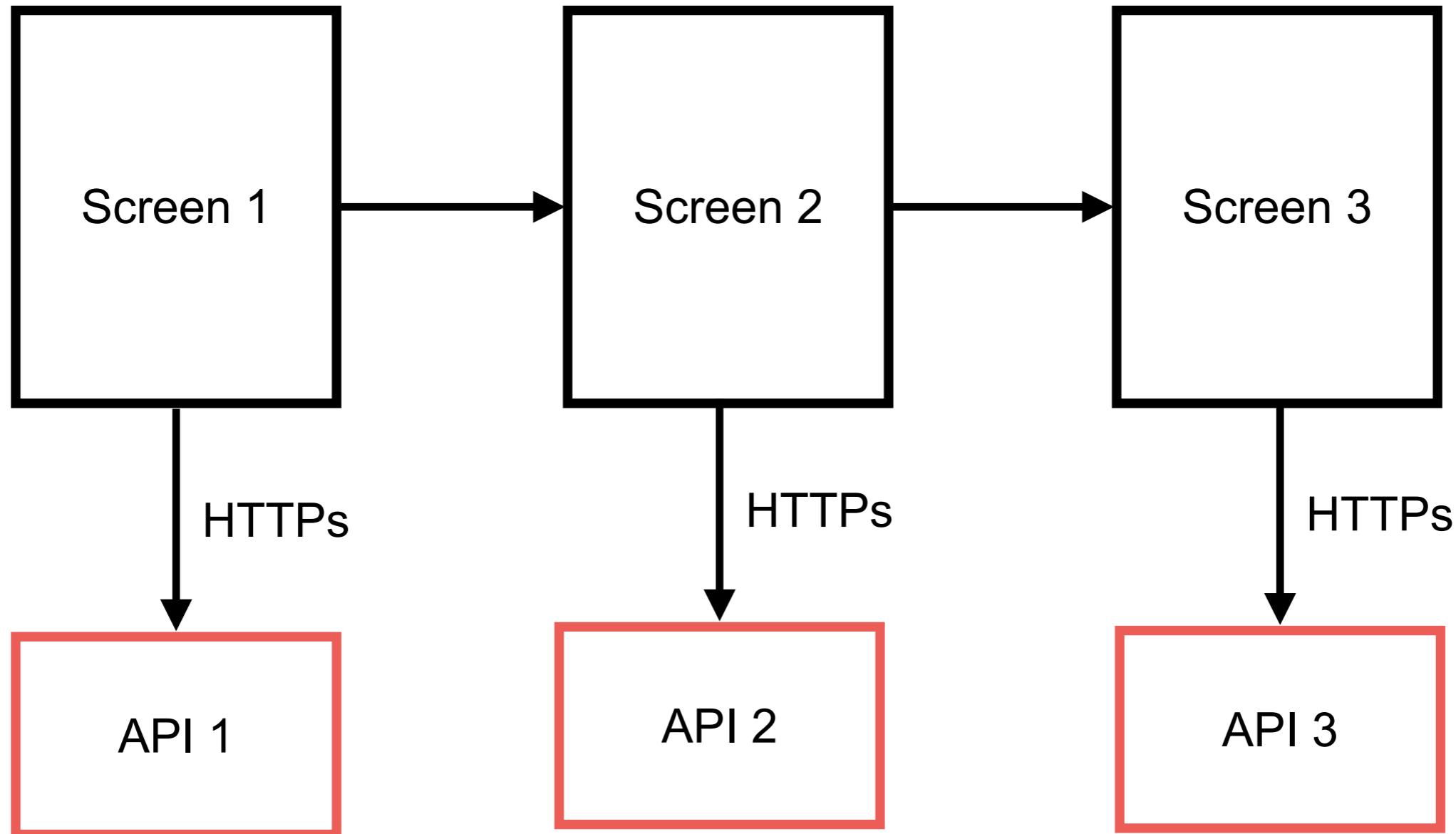
Integration Testing



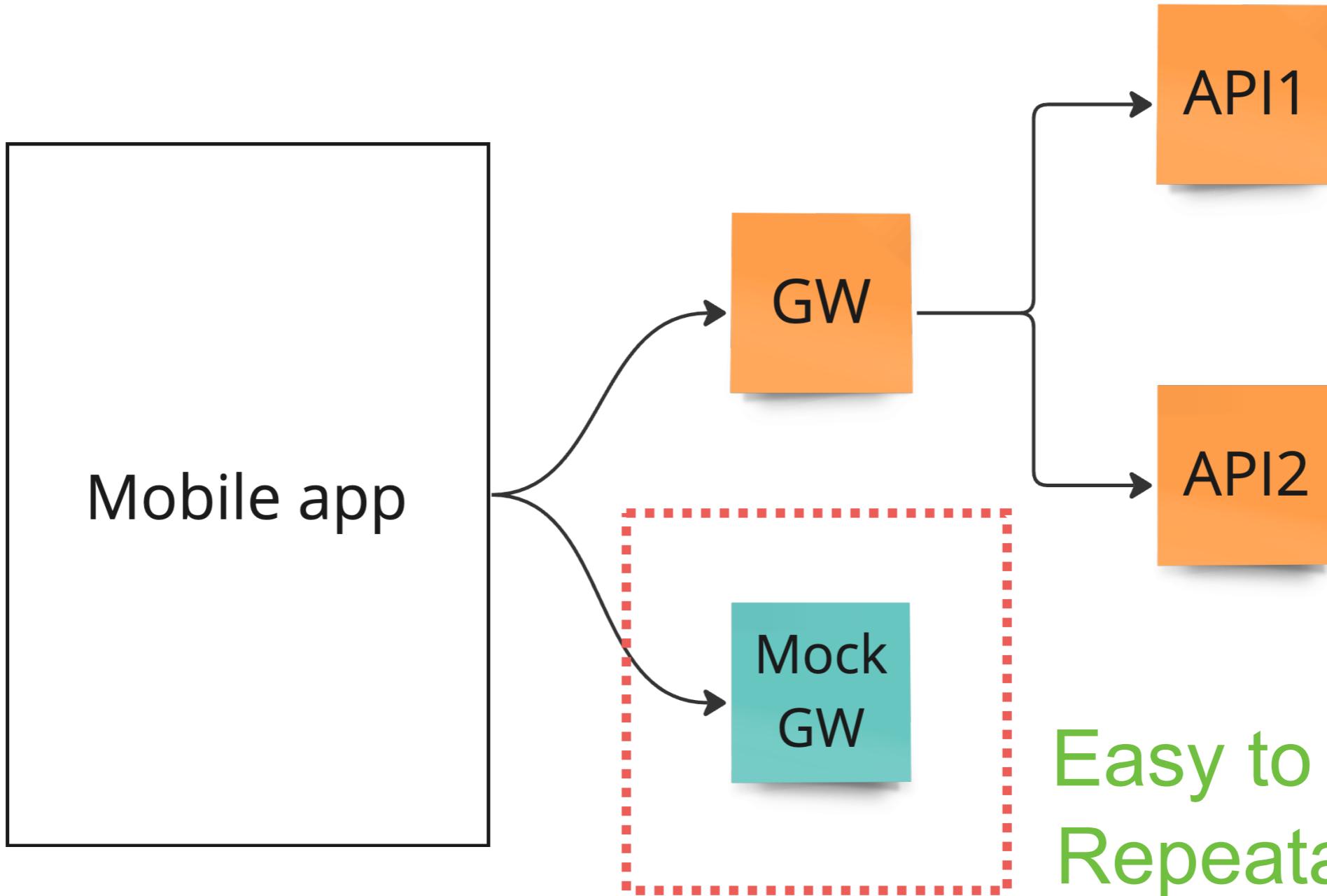
Difficult to test
Repeatable
Reliable



Integration Testing



Component Testing



Easy to test
Repeatable
Reliable



Mock Server (HTTPs)

Stubby4Node

<https://github.com/mrak/stubby4node>

MountBank

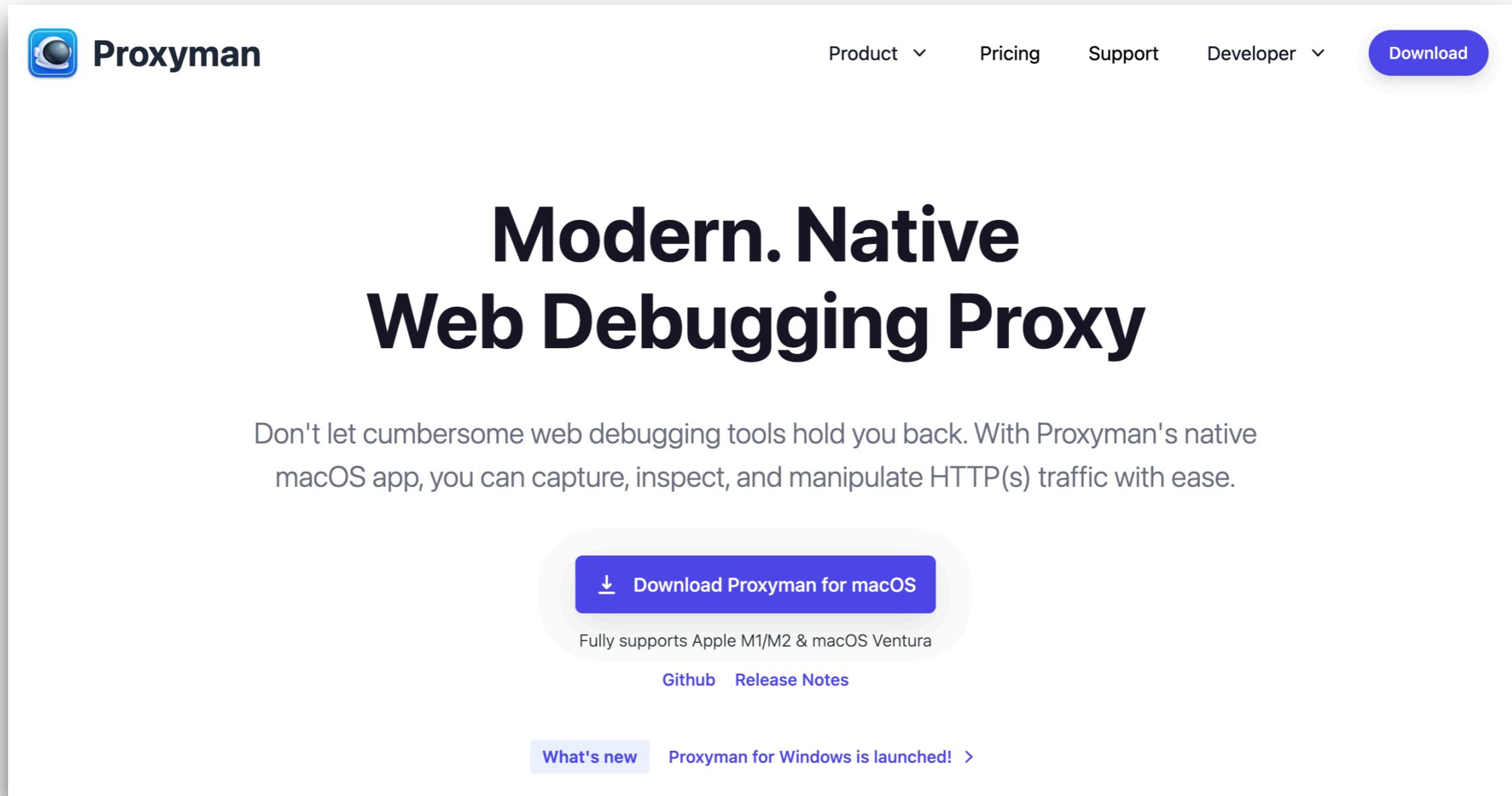
<https://www.mbttest.org/>

WireMock

<https://wiremock.org/>



Capture traffic from Mobile app

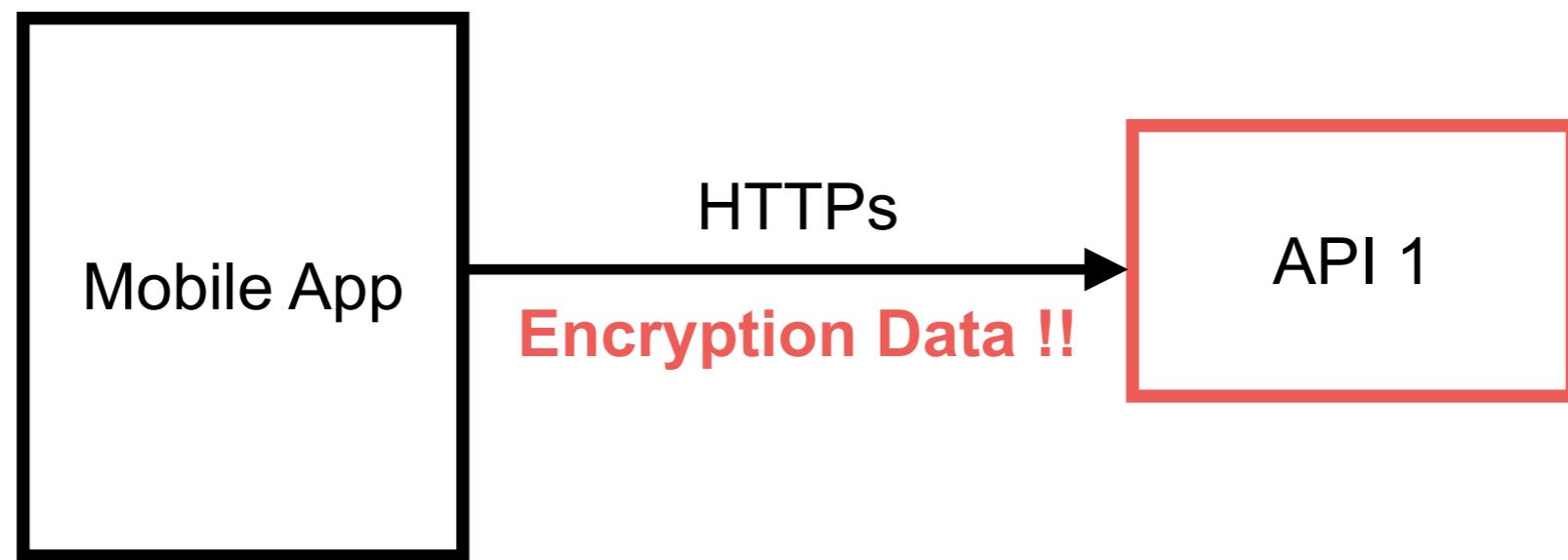


The screenshot shows the Proxyman website homepage. At the top left is the Proxyman logo (a blue square with a white 'P' and a globe icon). At the top right are navigation links: Product (with a dropdown arrow), Pricing, Support, Developer (with a dropdown arrow), and a blue 'Download' button. Below the navigation is a large title: 'Modern. Native Web Debugging Proxy'. A subtext below the title reads: 'Don't let cumbersome web debugging tools hold you back. With Proxyman's native macOS app, you can capture, inspect, and manipulate HTTP(s) traffic with ease.' In the center is a purple download button with the text 'Download Proxyman for macOS' and a downward arrow icon. Below the button is the text 'Fully supports Apple M1/M2 & macOS Ventura'. Underneath are links to 'Github' and 'Release Notes'. At the bottom of the main content area are two buttons: 'What's new' and 'Proxyman for Windows is launched! >'.

<https://proxyman.io/>



Encryption Data !!



Manage App's States

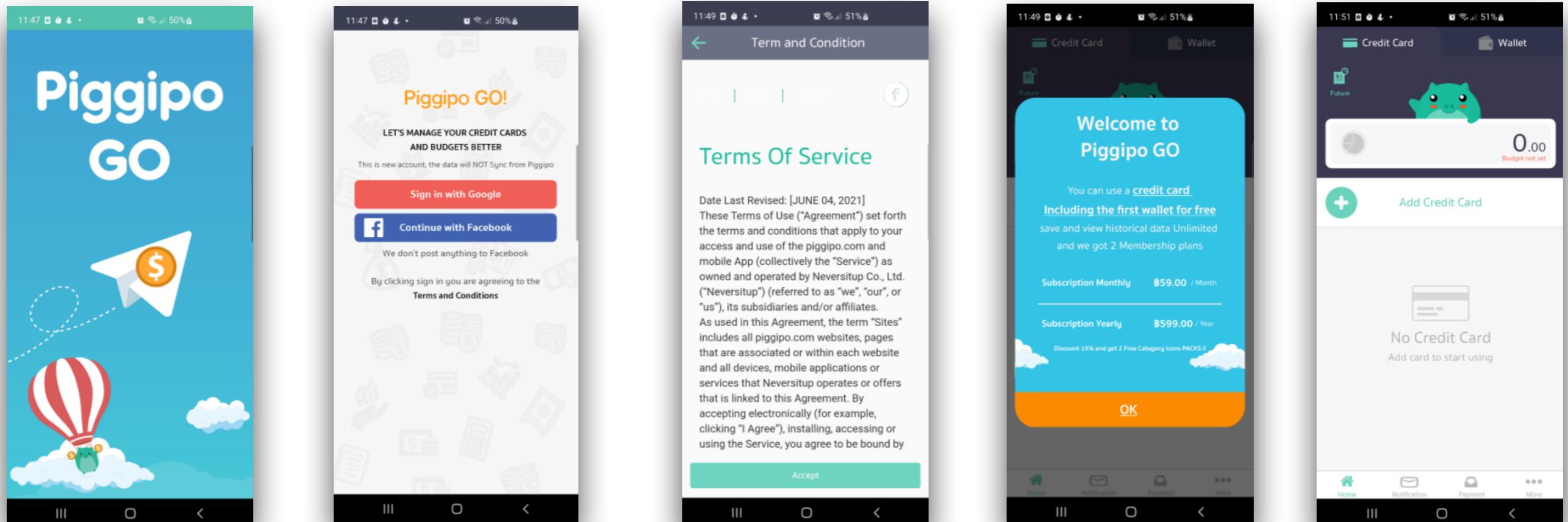


Manage App's States

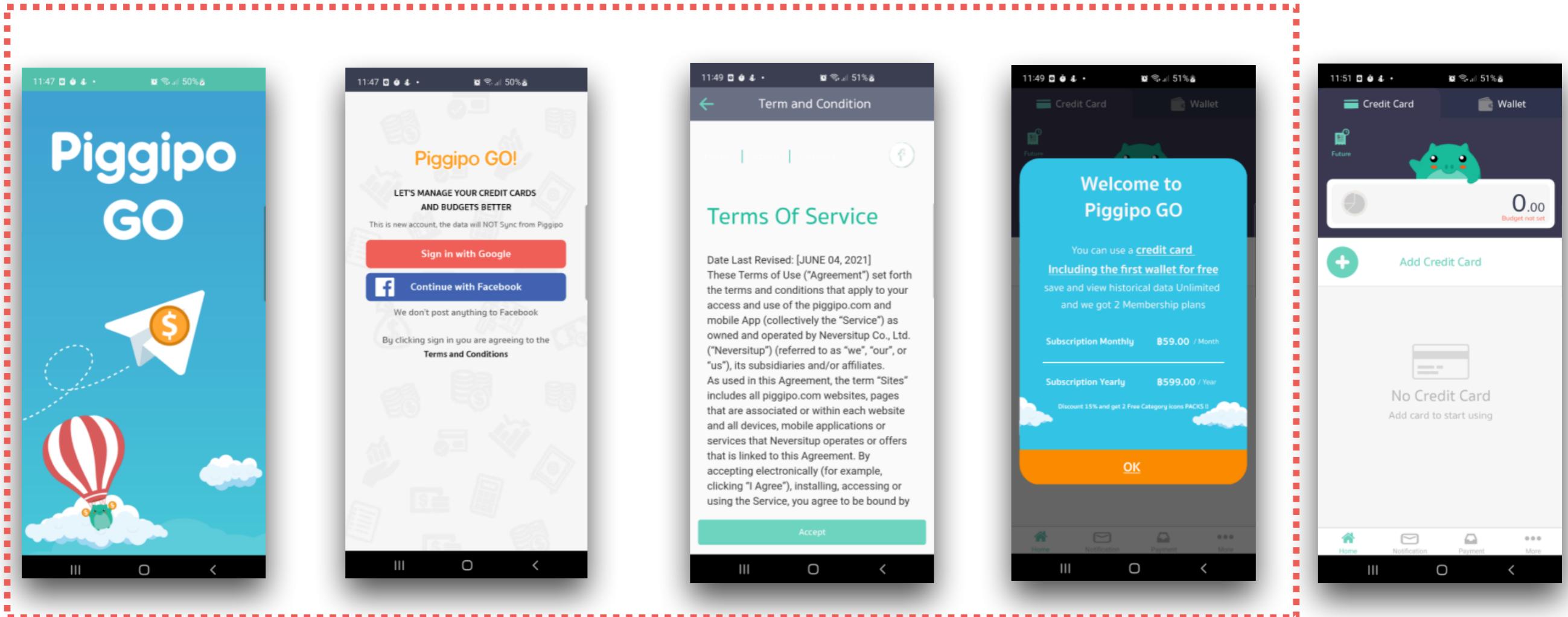
Easy for test
Reduce test steps



Manage App's States



Manage App's States



Manage App's States

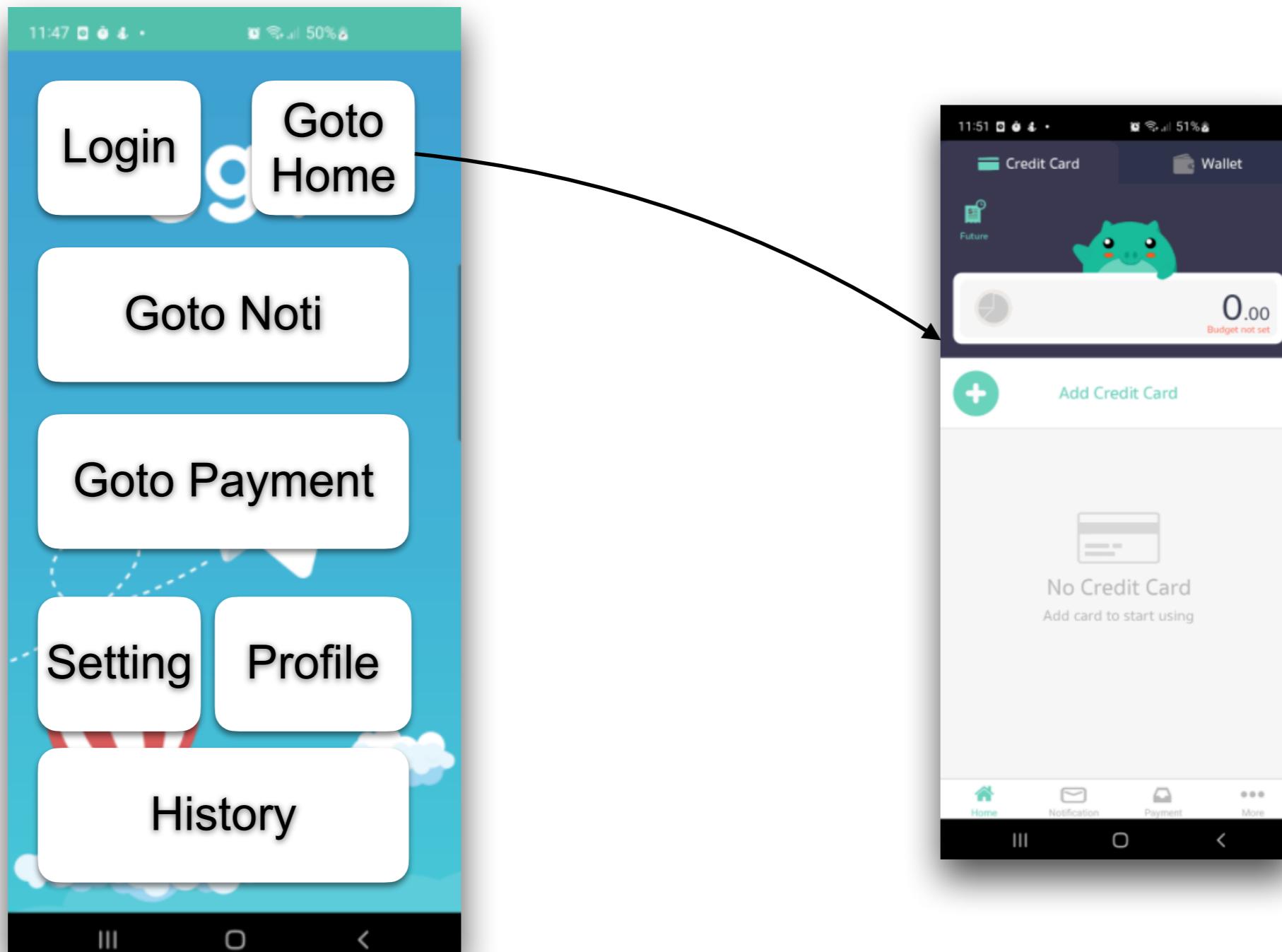
Use only in test build of the app

Screen with on-click link to all area of app

Link can even populate data



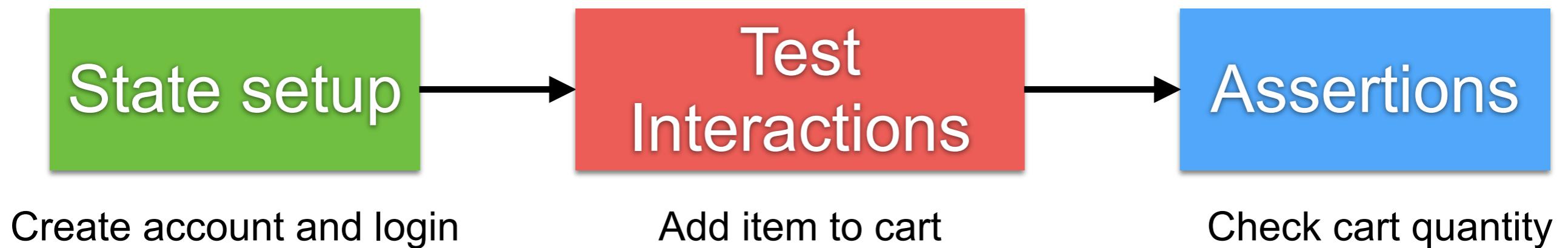
Manage App's States



State vs. Assertions

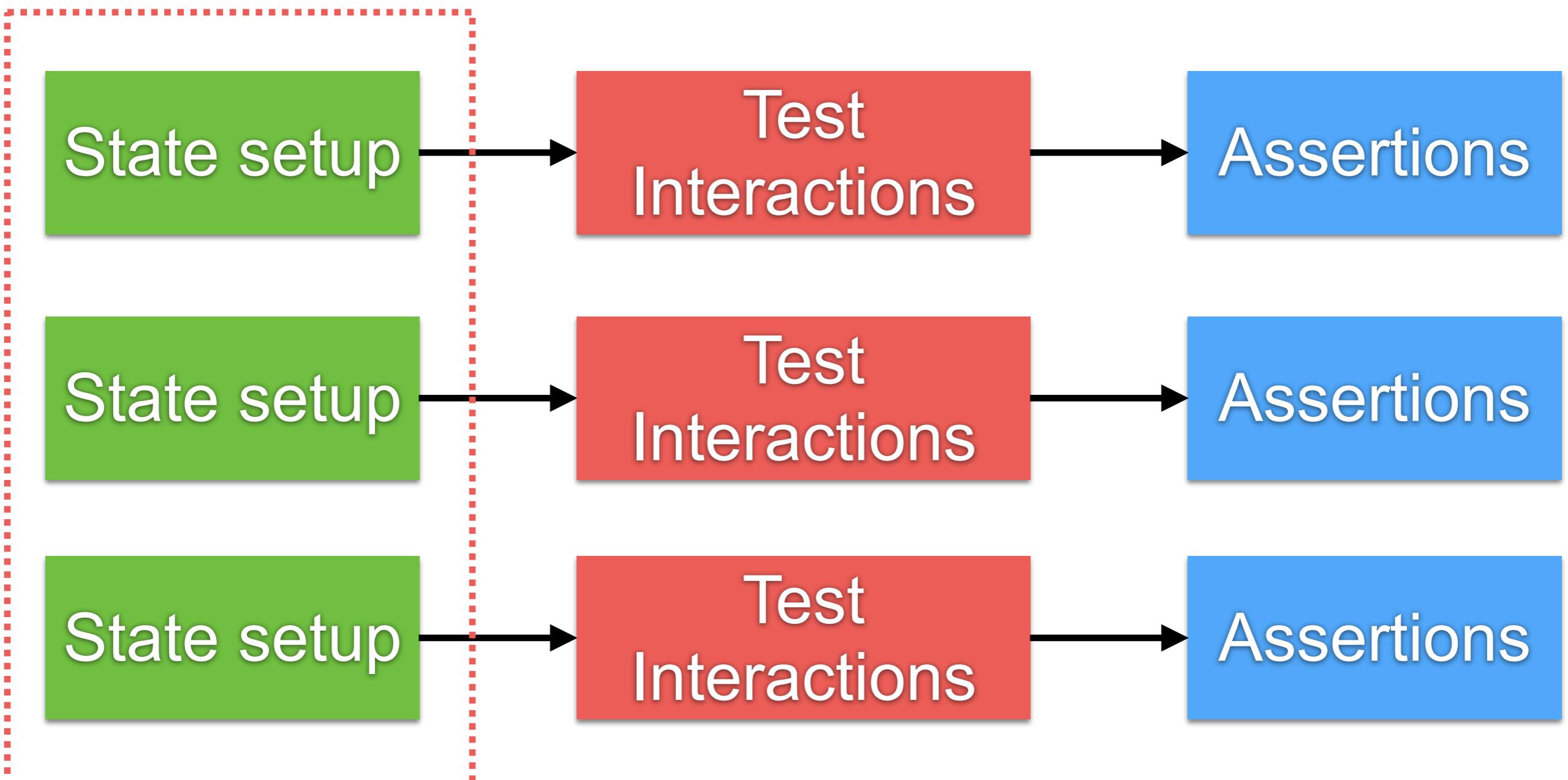


State vs. Assertions



State vs. Assertions

Not too much time !!



Make it Work



Make it Right



**Test-First
Test-Last
Test-Later**

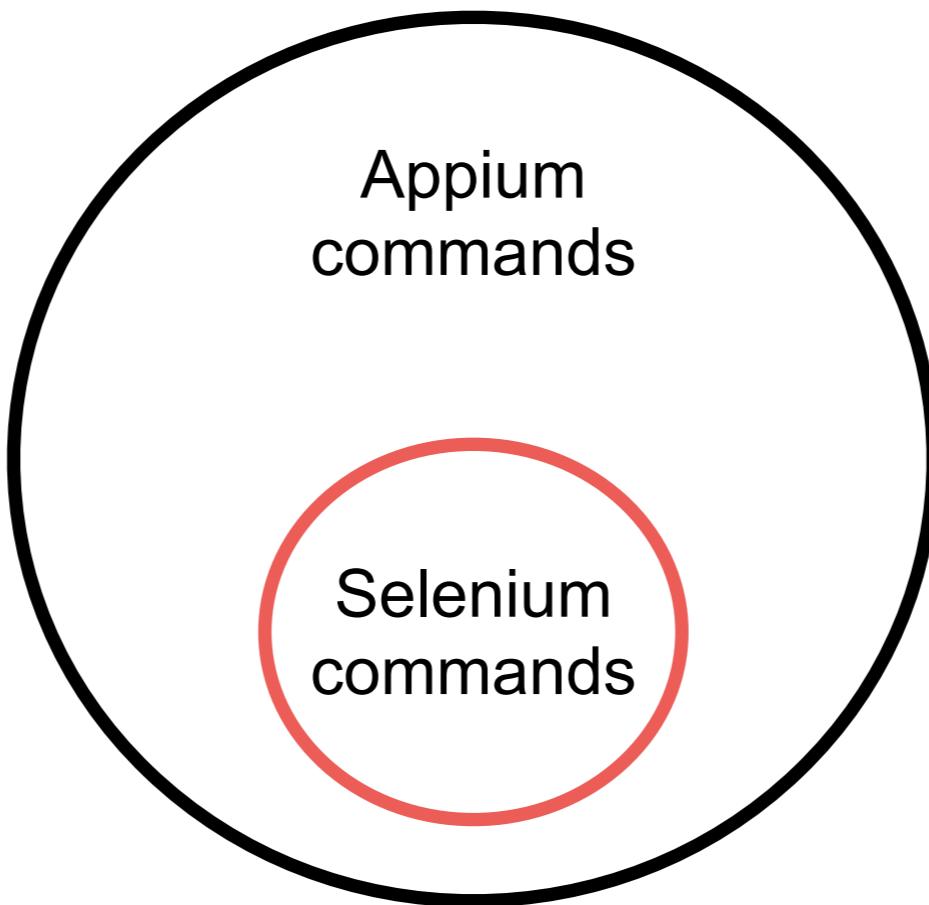


Let's start with Appium

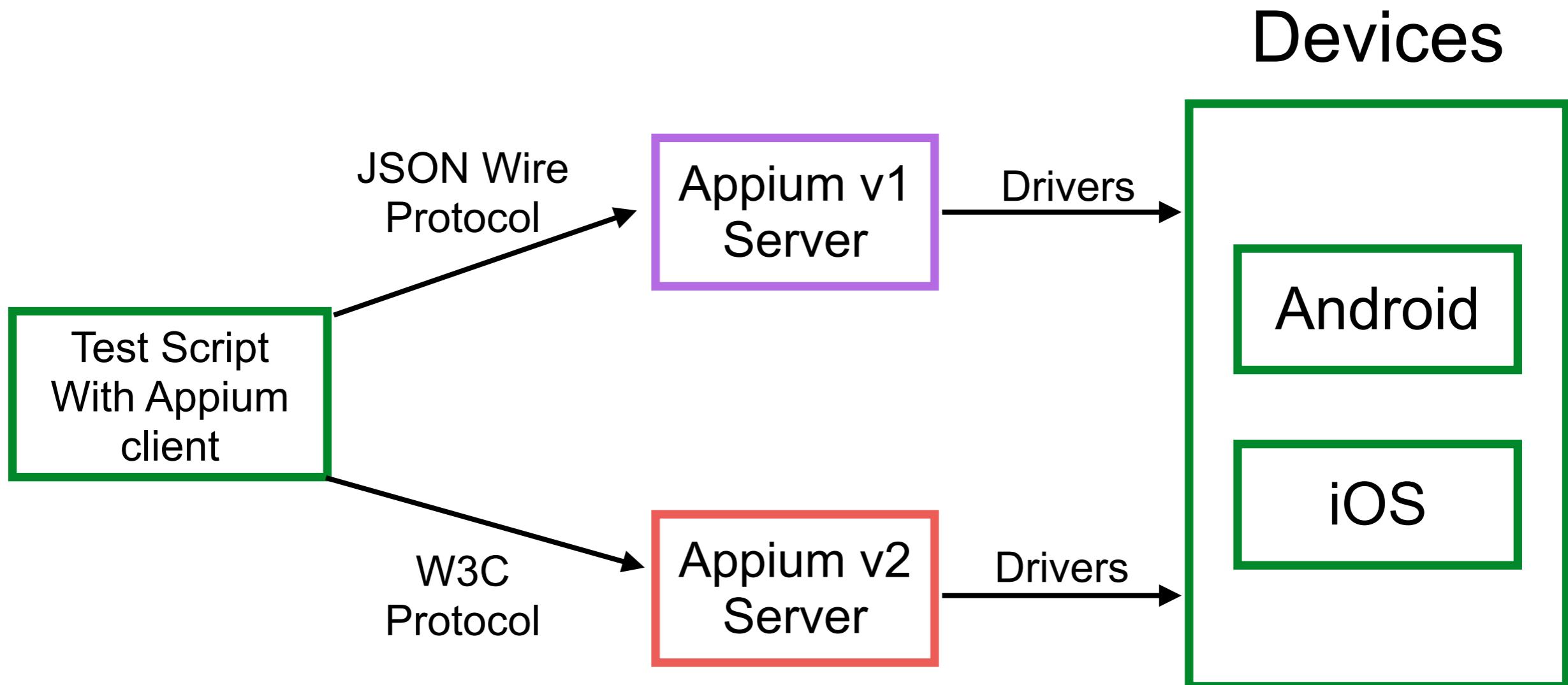


Appium

Automation tool for mobile app
Selenium for mobile
High compatibility with selenium



Architecture



Appium Tools

Appium Server via npm

Appium Server GUI/Desktop (deprecated)

Appium Inspector

<http://appium.io/docs/en/about-appium/getting-started/?lang=en#installing-appium>



Appium Clients

Ruby
Python
Java
C#

Robotframework + Appium Library

<http://appium.io/docs/en/about-appium/appium-clients/index.html>



Appium Drivers

Platform	Driver	Platform Versions	Appium Version
iOS	XCUITest	9.3+	1.6.0+
	UIAutomation	8.0 to 9.3	All
Android	Espresso	?+	1.9.0+
	UiAutomator2	?+	1.6.0+
	UiAutomator	4.3+	All
Mac	Mac	?+	1.6.4+
Windows	Windows	10+	1.6.0+

<https://appium.io/docs/en/latest/ecosystem/drivers/>



Drivers in workshop

Android

iOS

Flutter

UIAutomator2

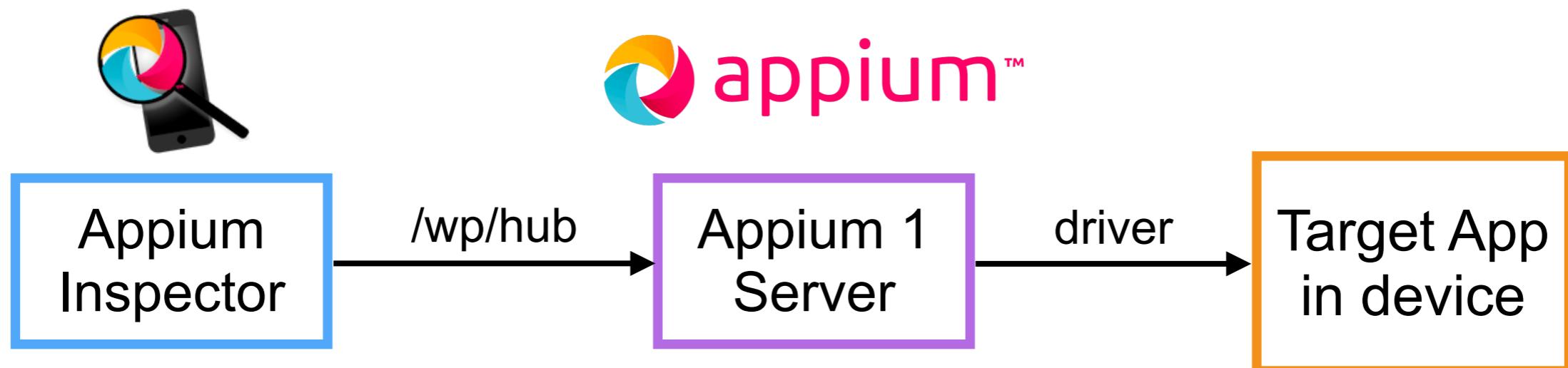
XCUITest

Flutter



Let's start with Appium

Appium doctor (android, iOS)



Steps to run

Appium doctor
Start server

Provide target apps (api, ipa/app)
Appium Inspector



Appium Doctor



Appium Doctor

Check before start with Appium...

```
$npm install -g @appium/doctor  
$appium-doctor
```

Android
env

iOS
env

<https://github.com/appium/appium/tree/master/packages/doctor>



Appium Doctor

\$appium-doctor

```
info AppiumDoctor Appium Doctor v.1.12.1
info AppiumDoctor ### Diagnostic for necessary dependencies starting ###
info AppiumDoctor ✓ The Node.js binary was found at: /Users/somkiat/.volta/tools/image/node
info AppiumDoctor ✓ Node version is 14.20.0
info AppiumDoctor ✓ Xcode is installed at: /Applications/Xcode.app/Contents/Developer
info AppiumDoctor ✓ Xcode Command Line Tools are installed in: /Applications/Xcode.app/Con
info AppiumDoctor ✓ DevToolsSecurity is enabled.
info AppiumDoctor ✓ The Authorization DB is set up properly.
WARN AppiumDoctor ✗ Carthage was NOT found!
info AppiumDoctor ✓ HOME is set to: /Users/somkiat
WARN AppiumDoctor ✗ ANDROID_HOME is NOT set!
WARN AppiumDoctor ✗ JAVA_HOME is NOT set!
WARN AppiumDoctor ✗ adb could not be found because ANDROID_HOME is NOT set!
WARN AppiumDoctor ✗ android could not be found because ANDROID_HOME is NOT set!
WARN AppiumDoctor ✗ emulator could not be found because ANDROID_HOME is NOT set!
WARN AppiumDoctor ✗ Bin directory for $JAVA_HOME is not set
info AppiumDoctor ### Diagnostic for necessary dependencies completed, 7 fixes needed. ###
info AppiumDoctor
info AppiumDoctor ### Diagnostic for optional dependencies starting ###
WARN AppiumDoctor ✗ opencv4nodejs cannot be found.
info AppiumDoctor ✓ ffmpeg is installed at: /usr/local/bin/ffmpeg. ffmpeg version 5.1 Copy
he FFmpeg developers
WARN AppiumDoctor ✗ mjpeg-consumer cannot be found.
WARN AppiumDoctor ✗ idb and idb_companion are not installed
info AppiumDoctor ✓ applesimutils is installed at: /usr/local/bin/applesimutils. Installed
```



Check environments

Android	iOS
APPIUM_HOME	APPIUM_HOME
ANDROID_HOME	Xcode
JAVA_HOME	Xcode command line tools
adb, emulator, apk analyzer	ios-deploy, applesimutils
NodeJS	NodeJS



List of android's devices

\$adb devices



List of iOS's devices

\$xcrun xctrace list devices

```
== Simulators ==
Apple TV Simulator (15.2) (9666637B-AD71-47CD-932D-DE7BA9096F46)
Apple TV 4K (2nd generation) Simulator (15.2) (2B6A15B3-4A03-41B5-B6C6-D7727DCA94D8)
Apple TV 4K (at 1080p) (2nd generation) Simulator (15.2) (EC5B5310-9DE7-4CB2-8AE2-172FC885DB8C)
iPad (9th generation) Simulator (15.2) (03B84395-1A2B-4759-B01A-171CD4F8F796)
iPad Air (4th generation) Simulator (15.2) (6389A3CA-7805-452D-9110-5B3796A9D9BB)
iPad Pro (11-inch) (3rd generation) Simulator (15.2) (40E522A5-14CE-453C-A54C-29D096F19236)
iPad Pro (12.9-inch) (5th generation) Simulator (15.2) (1E6E63EF-FA56-4E31-8082-13B0C664AD33)
iPad Pro (9.7-inch) Simulator (15.2) (9C7181D9-73D6-48BF-8972-80A73ADB2EA9)
iPad mini (6th generation) Simulator (15.2) (01F8F0AB-1AF5-4FBE-9587-B7713F7BBC6F)
iPhone 11 Simulator (15.2) (1E75E325-57EC-4D6D-85BF-9958B0A9B158)
iPhone 11 Pro Simulator (15.2) (7D50F81C-3521-447F-A79C-8613C6C58FEF)
iPhone 11 Pro Max Simulator (15.2) (FB336CEE-A241-43D1-8704-B0632EA9FD28)
iPhone 12 Simulator (15.2) (5325CF3D-9576-462A-A110-49A5D76665FE)
```

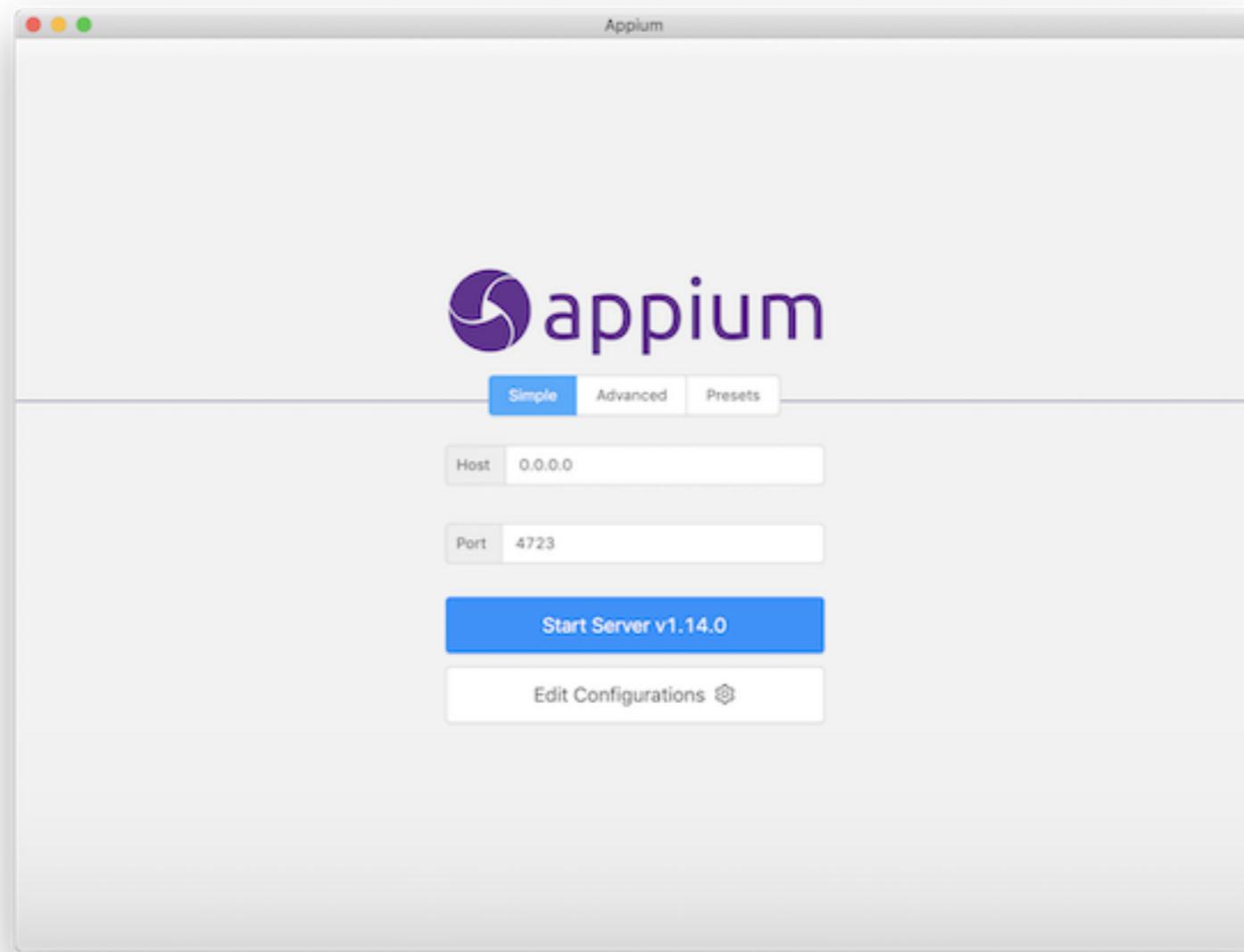


Appium Server



Appium Server Desktop

DEPRECATED !!!



<https://github.com/appium/appium-desktop>



Appium Server

Install via npm (required Node.js)

```
$npm install -g appium  
$appium
```

<https://github.com/appium/appium>

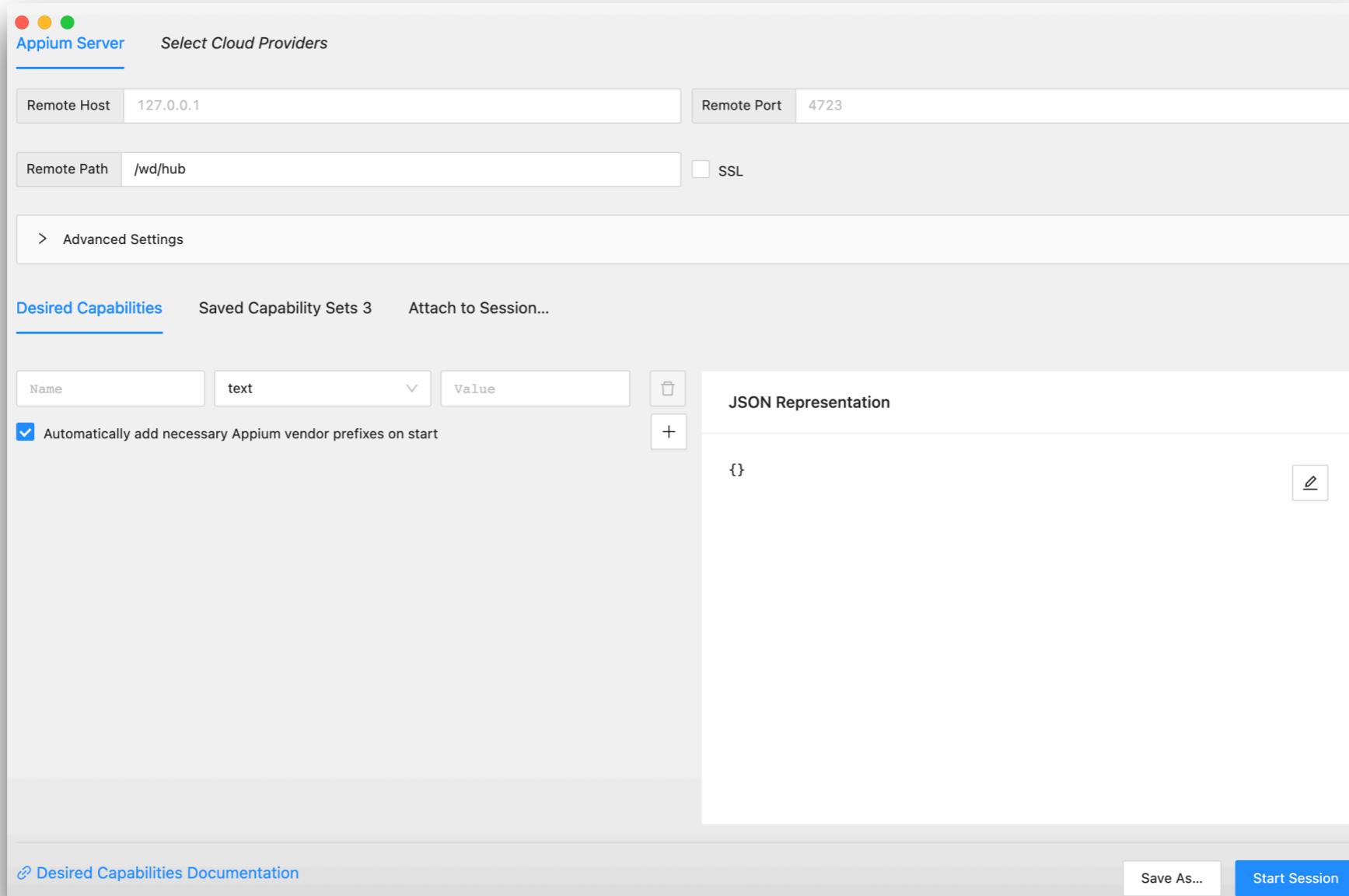


Appium Inspector



Appium Inspector

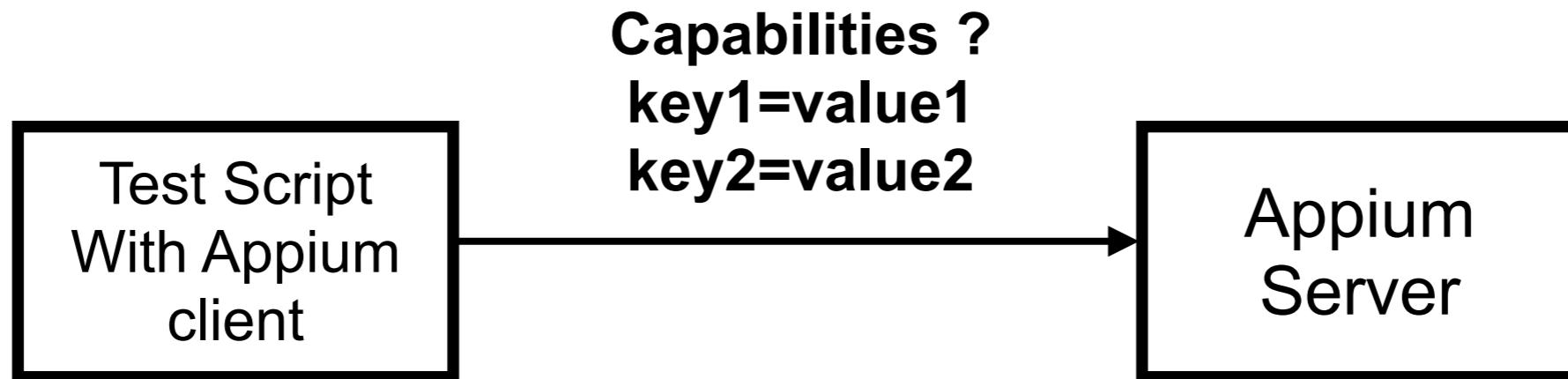
GUI inspector for mobile apps



<https://github.com/appium/appium-inspector>



Create a session with capabilities



<http://appium.io/docs/en/writing-running-appium/caps/index.html>



Required capabilities

Name	Description
platformName	Platform to automate (iOS, Android)
platformVersion	Version of platform
deviceName	Type of device to automate
app	Path to your app

<https://appium.io/docs/en/2.1/guides/caps/>



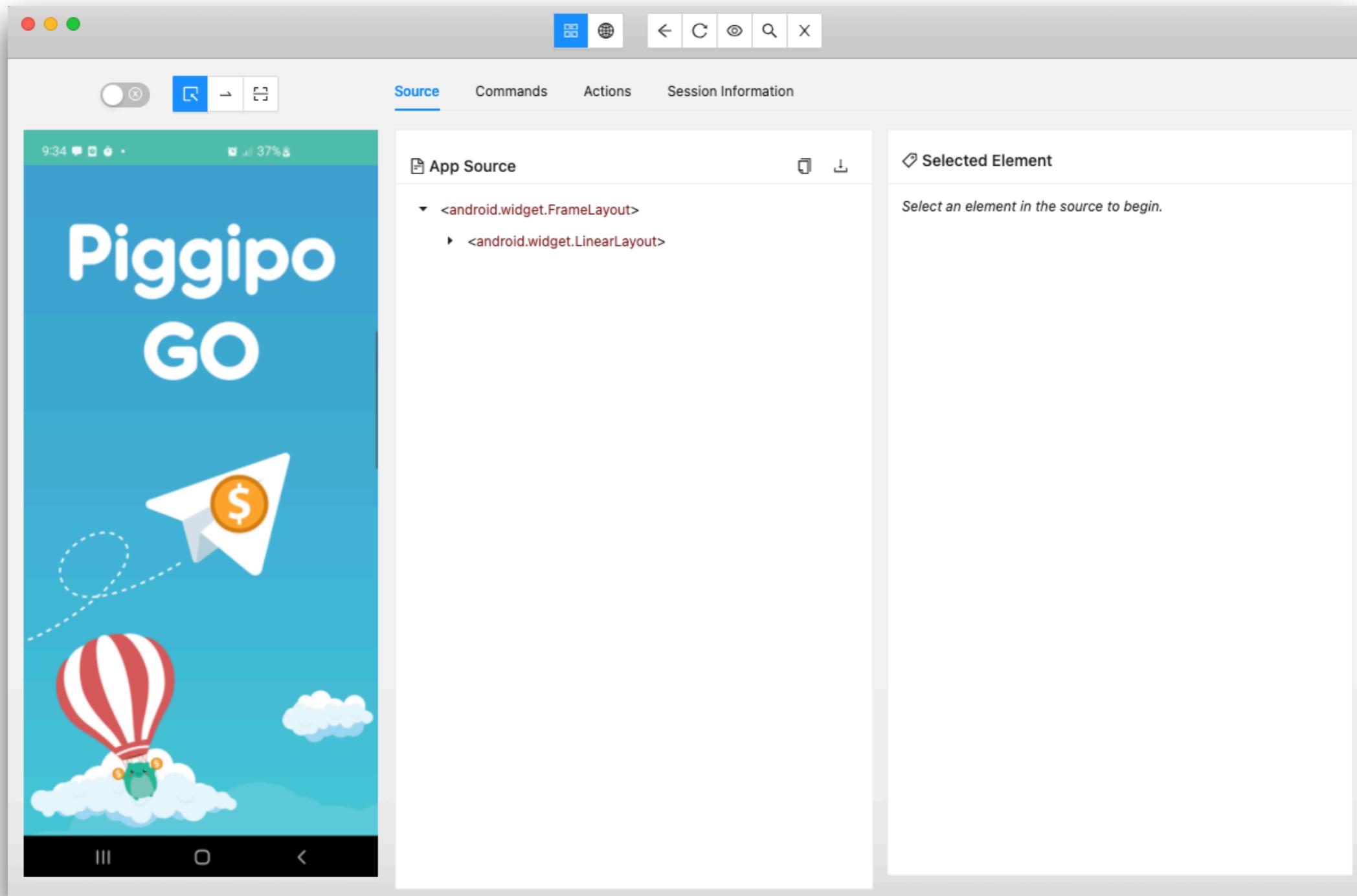
Session capabilities for android

```
{  
  "platformName": "Android",  
  "automationName": "UiAutomator2",  
  "app": "Path to APK file",  
  "deviceName": "ID/Name of target device"  
}  
?
```

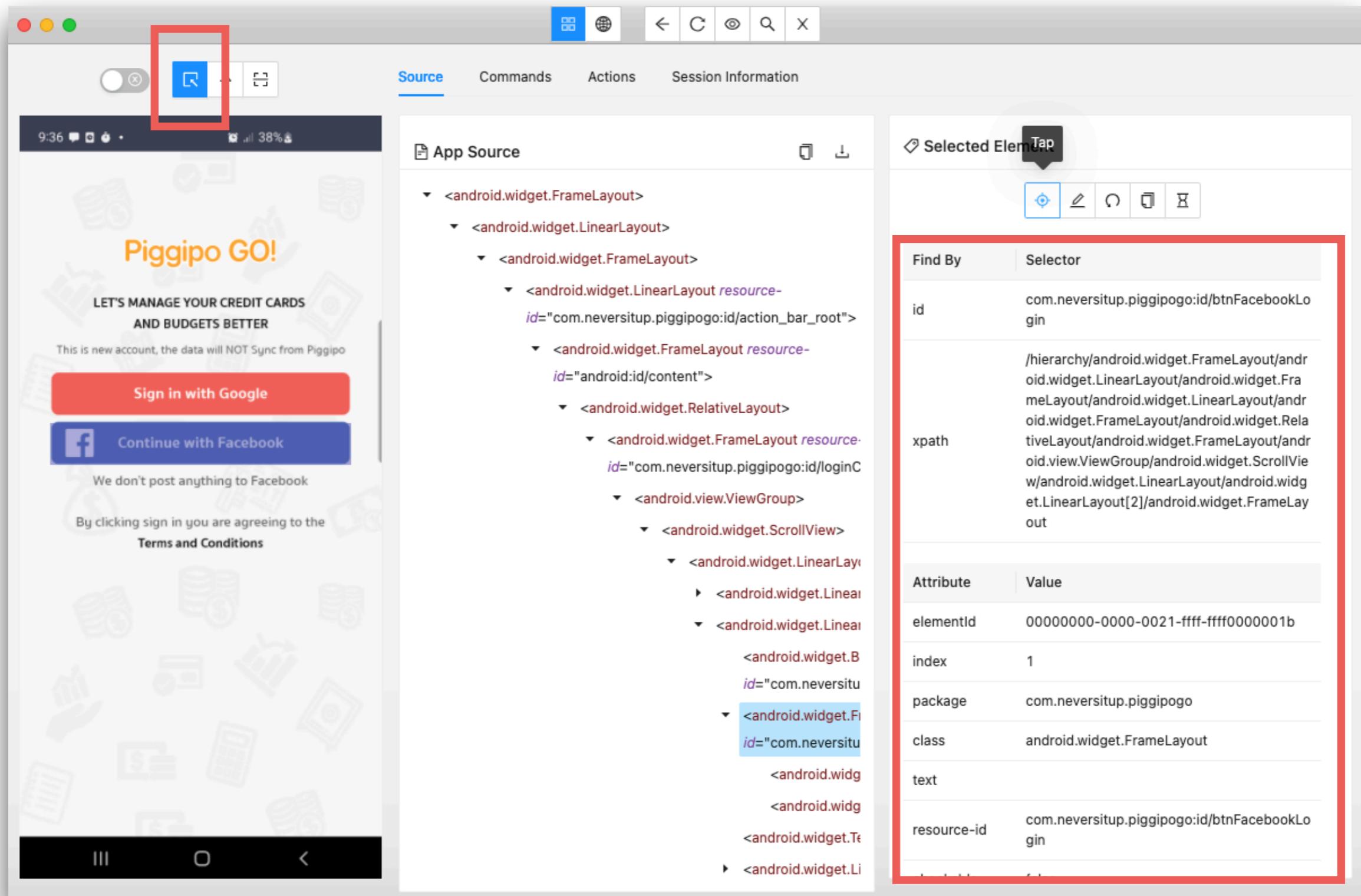
<https://appium.io/docs/en/drivers/android-uiautomator2/>



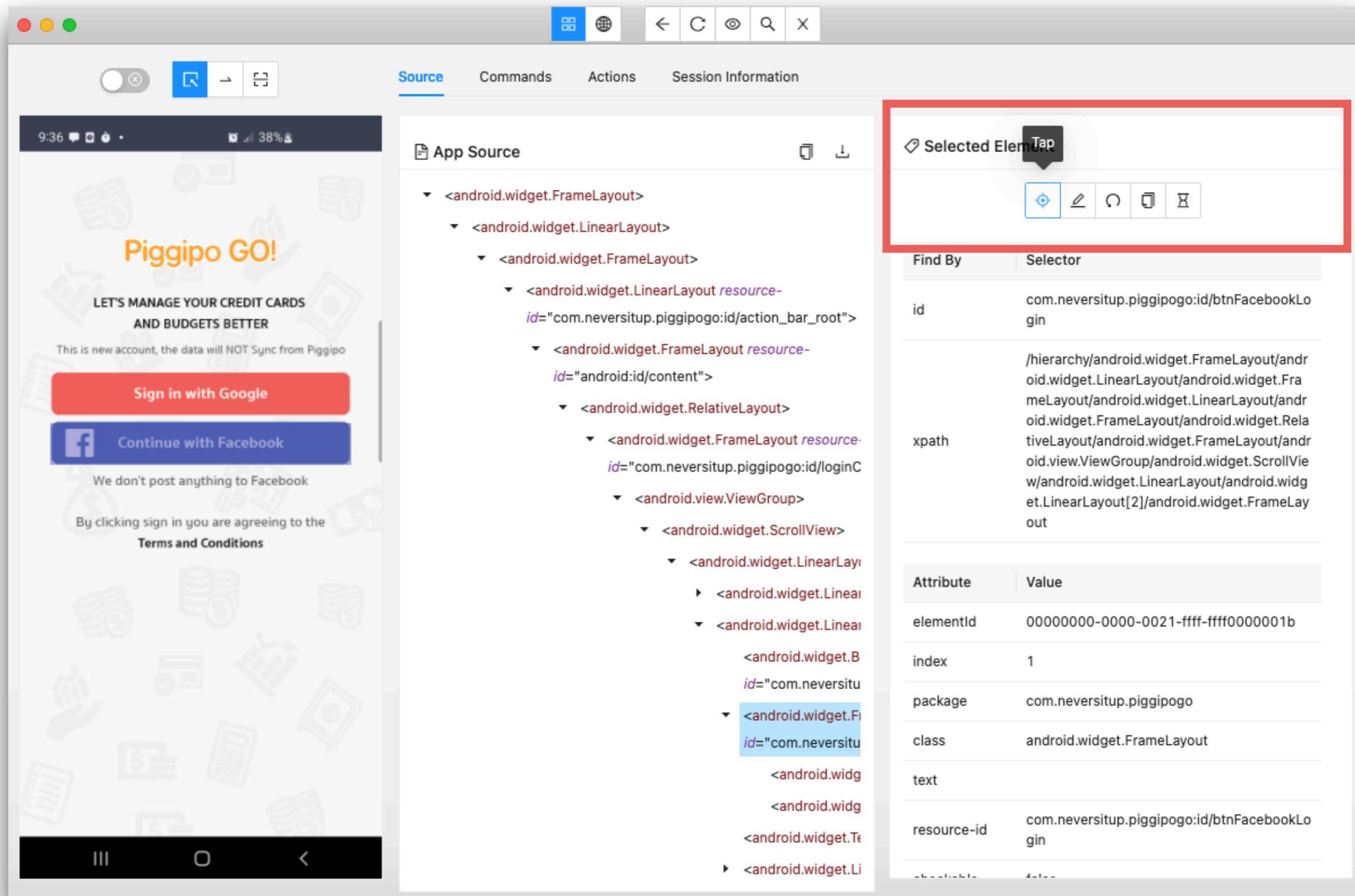
Appium Inspector



Inspect Element



Simulate actions on element



Code Example

The screenshot shows a desktop application window with a title bar and various icons. The main content area has tabs: Source, Commands, Actions, and Session Information. The Session Information tab is active, displaying session details:

Session Length	00:02:13
platform	LINUX
Session Details	webStorageEnabled false
	takesScreenshot true
Currently Active App ID	com.neversitup.piggipogo

Below this, a red box highlights a section titled "Start this Kind of Session with Code". It contains sample code for the Robot Framework:

```
# This sample code uses the Appium robot client
# pip install robotframework-appiumlibrary
# Then you can paste this into a file and simply run with robot
#
# more keywords on: http://serhatbolsu.github.io/robotframework-appiumlibrary/AppiumLibrary.html

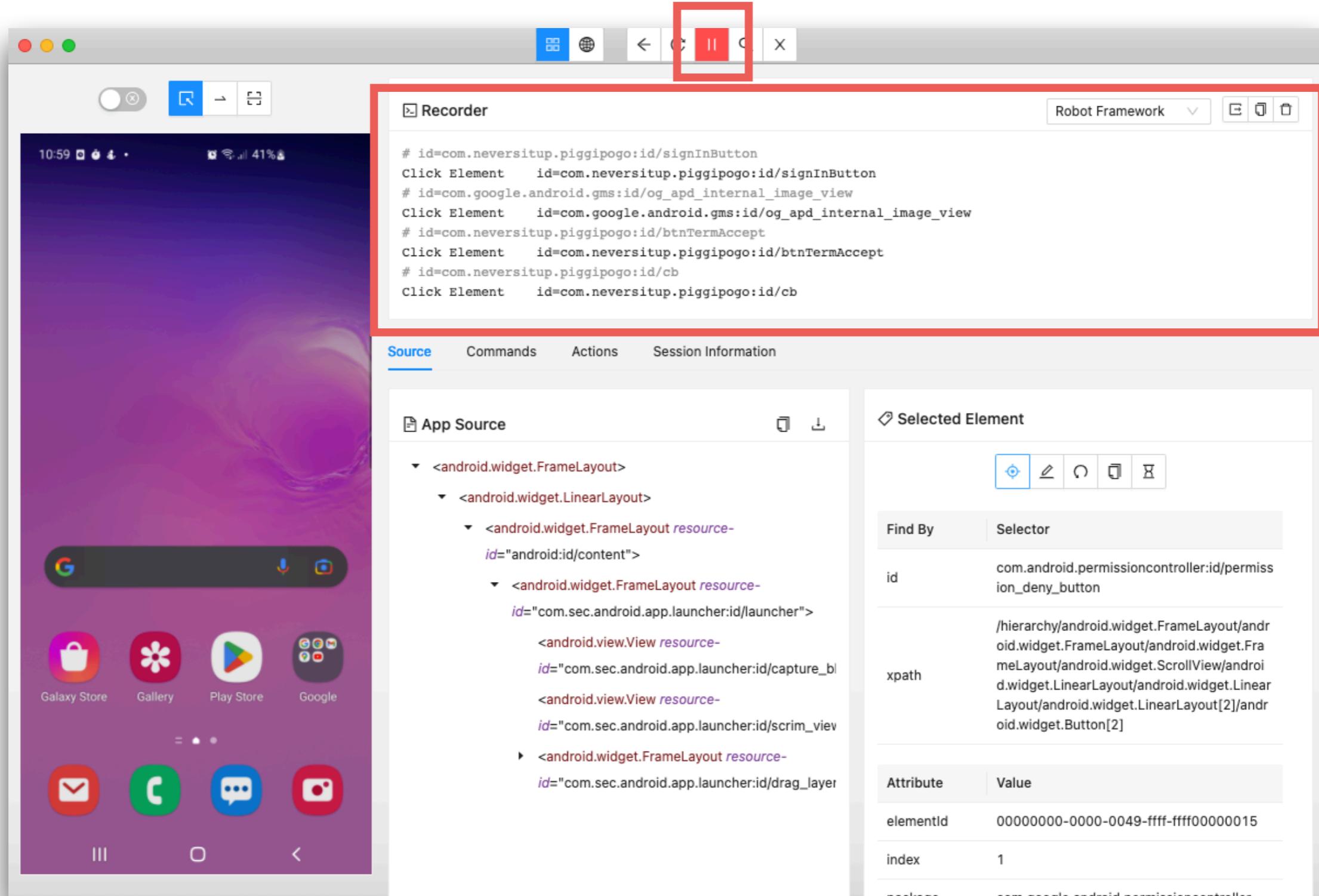
*** Settings ***
Library          AppiumLibrary
Test Teardown    Quit Application
Suite Teardown   Close Application

*** Variables ***
${REMOTE_URL}    http://127.0.0.1:4723/wd/hub
${platformName}   Android
${appium:app}      /Users/somkiat/data/slide/appium/workshop/PiggipoGO_1.2.21.apk
${appium:deviceName} R58M36QKSJK
${appium:automationName} UiAutomator2
${appium:ensureWebviewsHavePages}  True
${appium:nativeWebScreenshot}     True
```

To the right of the code, a dropdown menu shows other frameworks: Robot Framework (selected), JS - WD (Promise), JS - Webdriver.io, JS - Oxygen HQ, Java - JUnit, Python, Ruby.



Try to record test script



Session capabilities for iOS

```
{  
  "platformName": "Android",  
  "automationName": "XCUITest",  
  "app": "Path to IPA file",  
  "platformVersion": "14.5"  
  "deviceName": "ID/Name of target device"  
}
```

<https://appium.io/docs/en/drivers/ios-xcuitest/index.html>



Finding and Using Elements

Isolated from UI !!



Locator Strategies

Strategy	Description
Accessibility ID	iOS = accessibility-id Android = content-desc
ID	iOS = name Android = resource-id
Name	Name of element
XPath	Pattern of element in XML (not recommended) Absolute path vs Relative path ?
Class name	Don't

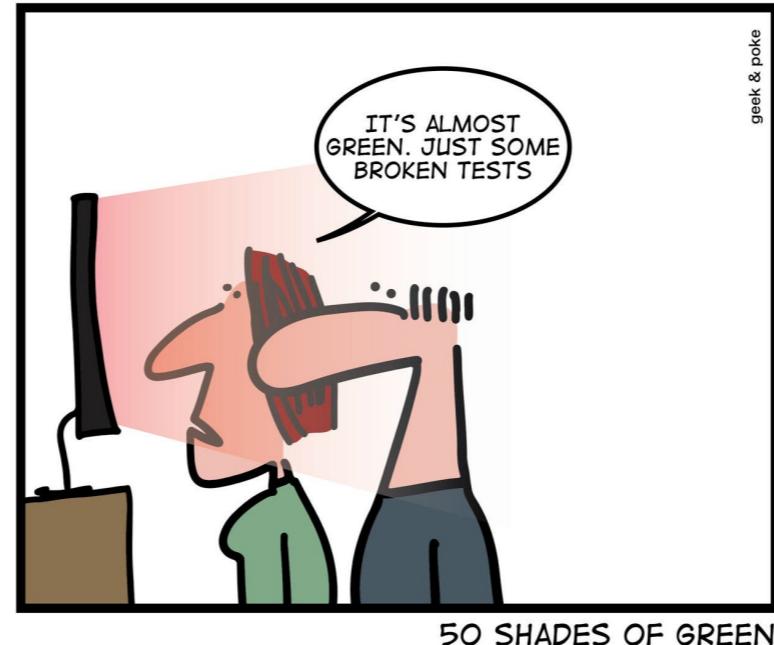
<http://appium.io/docs/en/commands/element/find-elements/index.html#selector-strategies>



Good Locators

Unique
Descriptive
Resilient

Shorter in length (maintainability)



XPath

XML Path Language
Query language used to identify tag in XML
Appium builds XML representation of app

XPath is powerful but very dangerous



Benefits of XPath

Find any element that exists

Find elements by using complex criteria



Cons of XPath

XPath selectors can be brittle

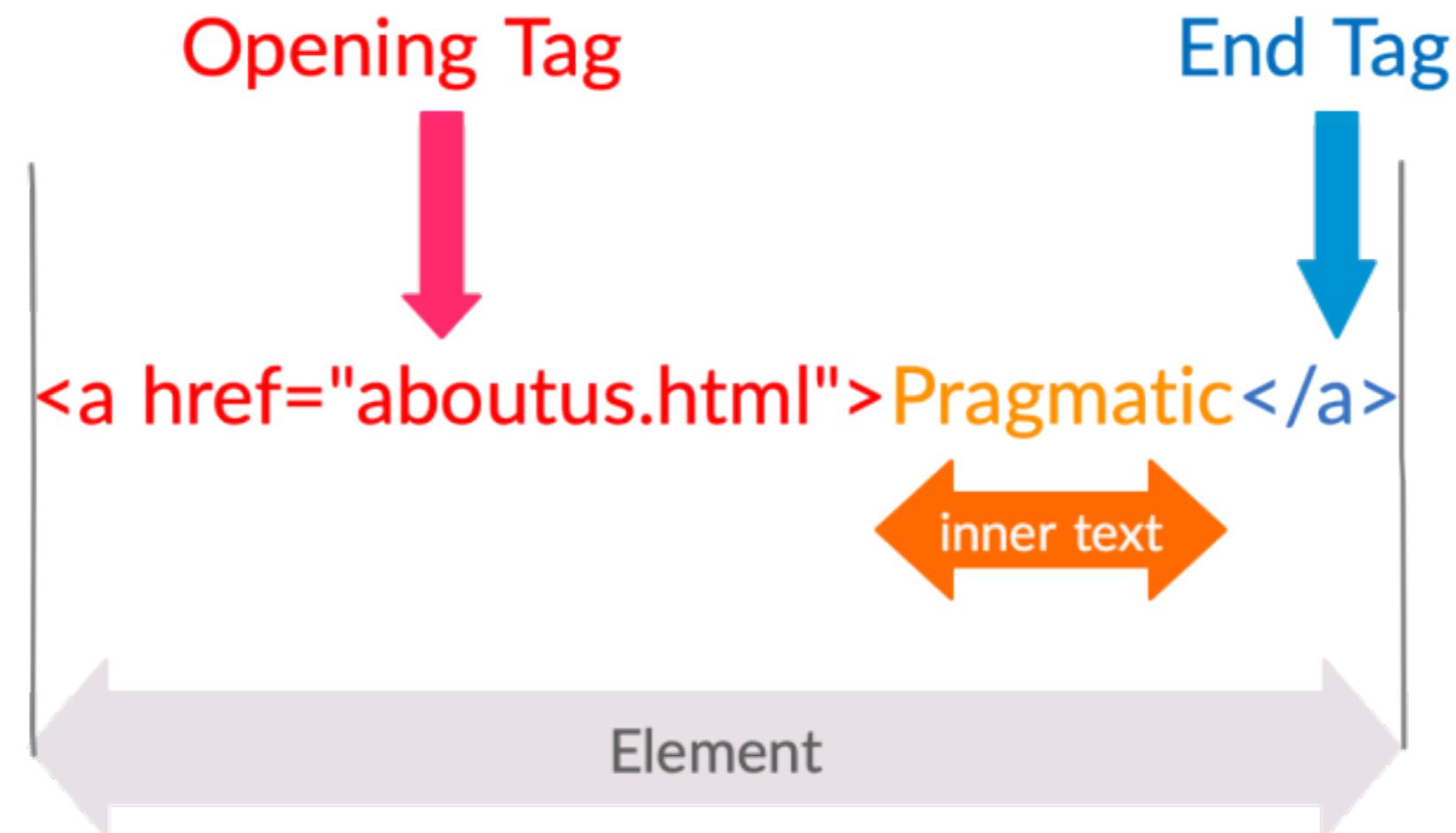
Slow

Broken test !!

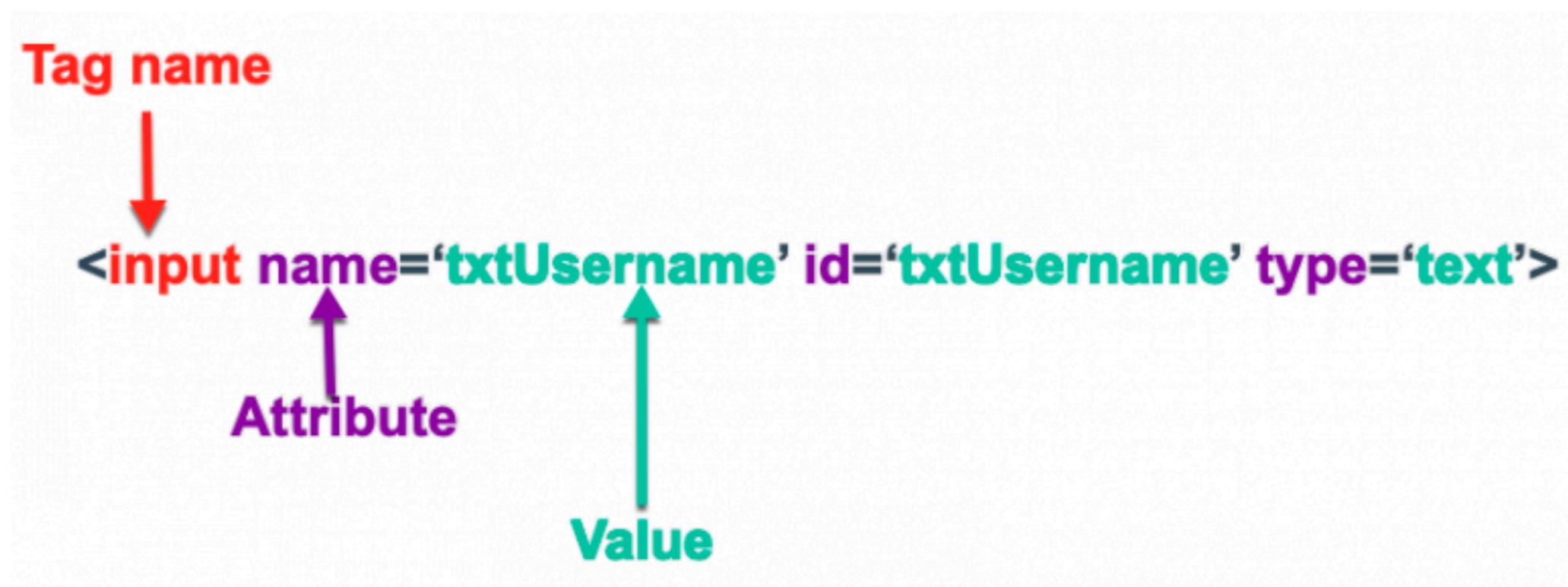
Avoid brittle selectors by rely on unique tag attribute



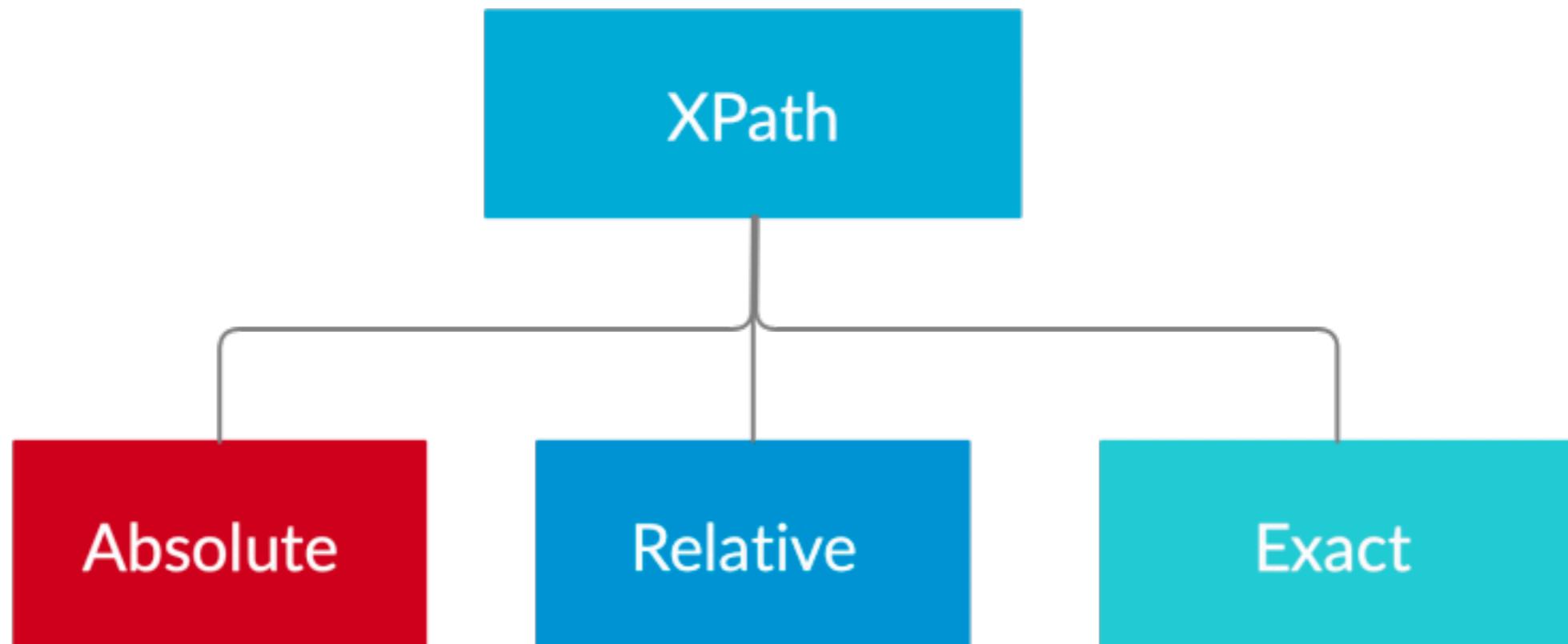
XPath



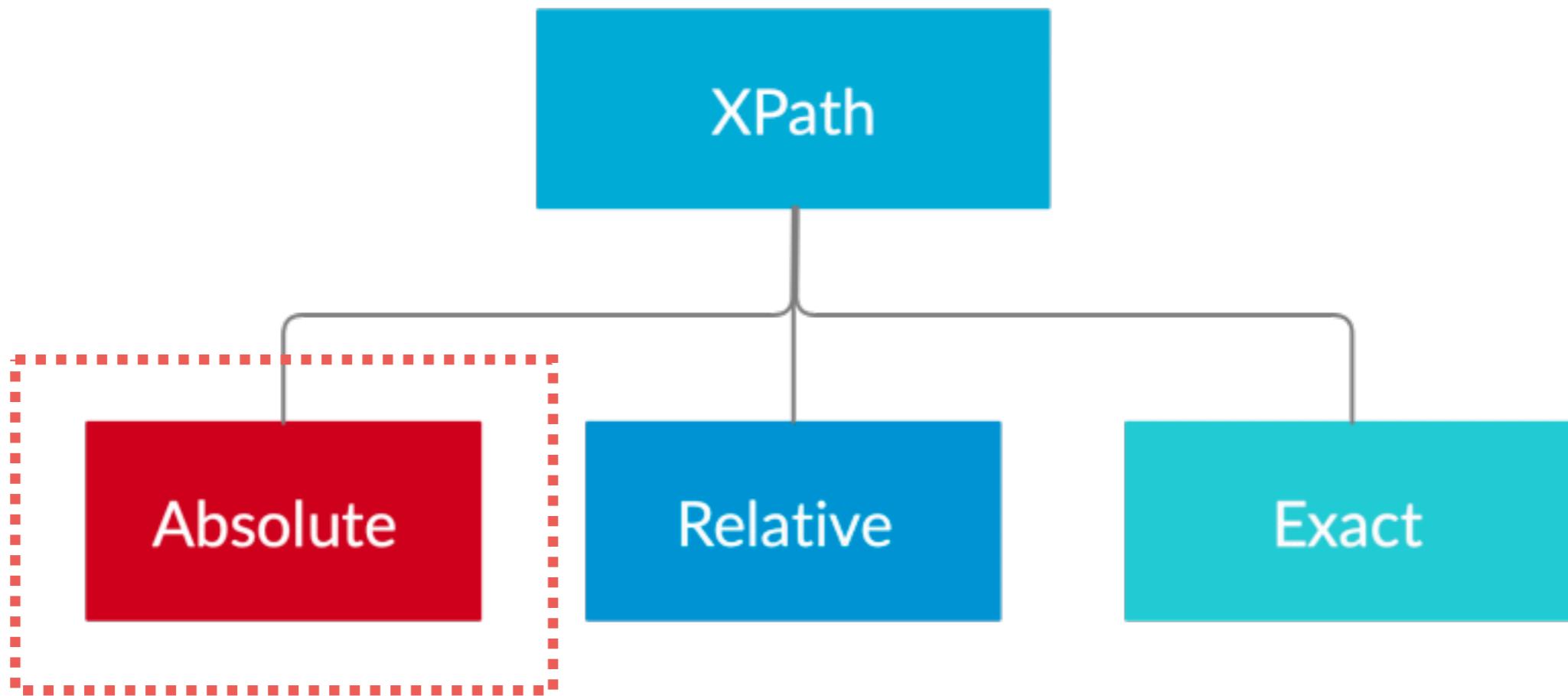
XPath



Types XPath



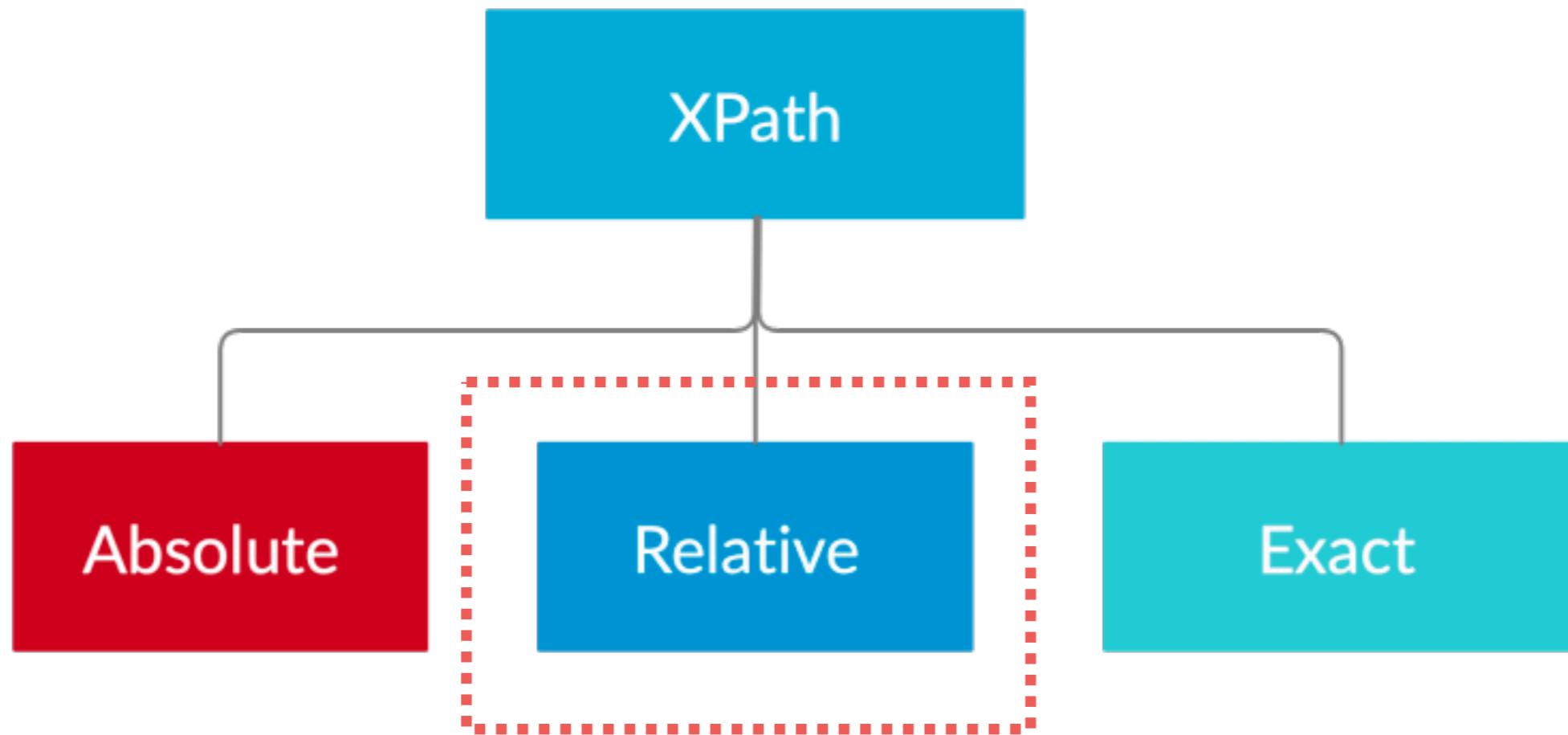
Don't use !!



`/html/body/div[1]/div/div[2]/form/div[2]/input`



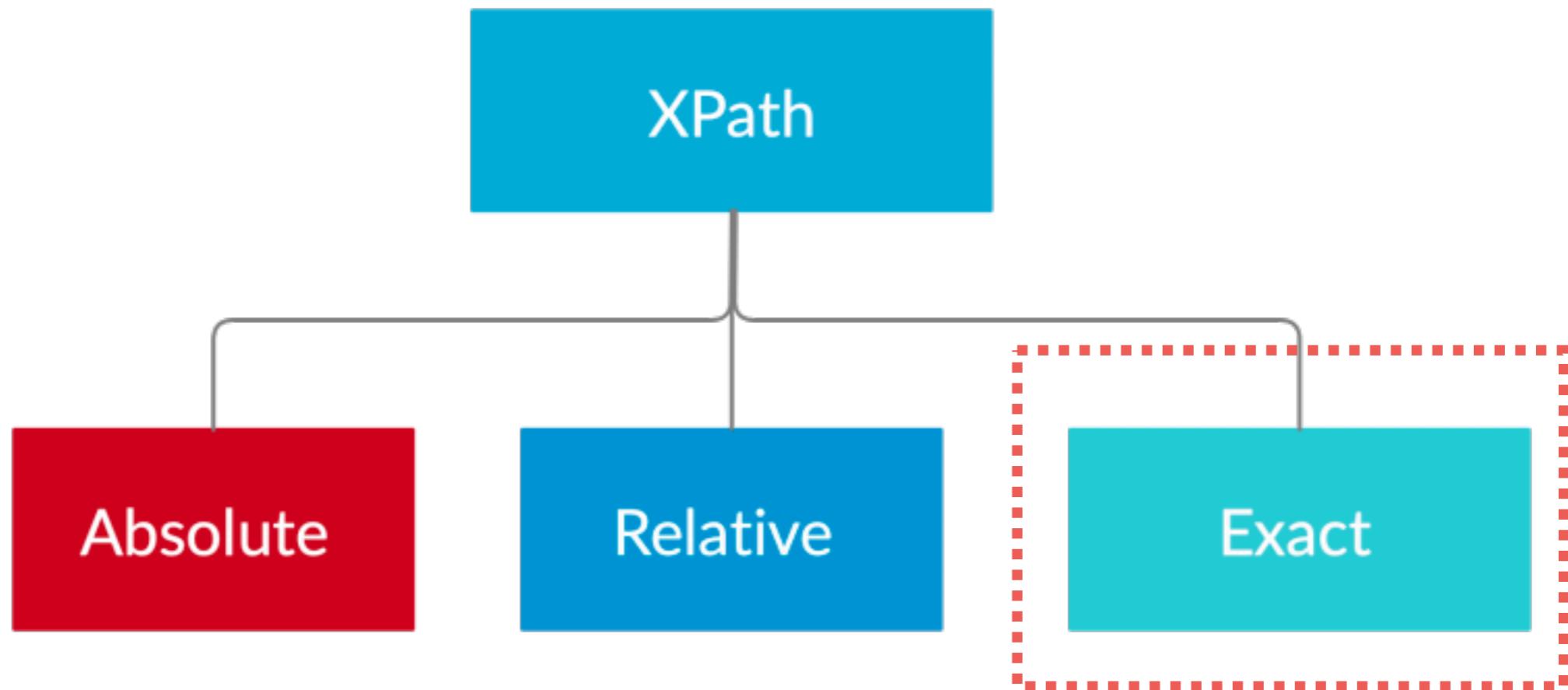
Relative



```
//div[@id='divUsername']/input  
//form/div[@id='divUsername']/input  
//form/*/input
```



Exact



```
//div[@class='datevalue currmonth']//span[./text()='2']
```



**Absolute faster than Relative
But shortest is better**



Element Interactions



Element Interactions

Command	Description
click()	Tab an element
sendKeys()	Enter keystrokes into an input field
clear()	Clear an input field
getText()	Retrieve the text displayed from a field or label

<http://appium.io/docs/en/commands/element/find-elements/index.html#selector-strategies>



Waiting for Elements



Waiting ...

Static waits (sleep) !!

Explicit waits

Wait until the element is found before proceeding
the next step

Wait Until Element Is Visible

Wait Until Page Contains

Wait Until Page Contains Element

Wait Until Page Does Not Contain

Wait Until Page Does Not Contain Element



Learn to read Appium logs

```
[HTTP] {}
[AndroidUiautomator2Driver@0c13 (97cf7a81)] Driver proxy active, passing request on via HTTP proxy
[debug] [AndroidUiautomator2Driver@0c13 (97cf7a81)] Matched '/session/97cf7a81-37ce-4ac4-bd05-4d029612237e/source' to command name 'getPageSource'
[debug] [AndroidUiautomator2Driver@0c13 (97cf7a81)] Proxying [GET /session/97cf7a81-37ce-4ac4-bd05-4d029612237e/source] to [GET http://127.0.0.1:8200/session/fe20a07f-45ed-4502-91f5-05df40569d7e/source] with no body
[debug] [AndroidUiautomator2Driver@0c13 (97cf7a81)] Got response with status 200: {"sessionId":"fe20a07f-45ed-4502-91f5-05df40569d7e","value":"<?xml version='1.0' encoding='UTF-8' standalone='yes' ?>\r\n<hierarchy index=\"0\" class=\"hierarchy\" rotation=\"0\" width=\"1080\" height=\"1857\">\r\n  <android.widget.FrameLayout index=\"0\" package=\"com.amazonaws.devicefarm.android.referenceapp\" class=\"android.widget.FrameLayout\" text=\"\" checkable=\"false\" checked=\"false\" clickable=\"false\" enabled=\"true\" focusable=\"false\" focused=\"false\" long-clickable=\"false\" password=\"false\" scrollable=\"false\" selected=\"false\" bounds=\"[0,0][1080,1857]\" displayed=\"true\">\r\n    <android.widget.LinearLayout index=\"0\" package=\"com.amazonaws.devicefarm.android.referenceapp\" class=\"android.widget.LinearLayout\" text=\"\" checkable=\"false\" checked=\"false\" clickable=\"false\" enabled=\"true\" focusable=\"false\" focused=\"false\" long-clickable=\"false\" password=\"false\" scrollable=\"false\" selected=\"false\" bounds=\"[0,0][1080,1857]\" displayed=\"true\">\r\n      <android...>
[AndroidUiautomator2Driver@0c13 (97cf7a81)] Replacing sessionId fe20a07f-45ed-4502-91f5-05df40569d7e with 97cf7a81-37ce-4ac4-bd05-4d029612237e
[HTTP] <-- GET /session/97cf7a81-37ce-4ac4-bd05-4d029612237e/source 200 51 ms - 26619
[HTTP]
[HTTP] --> POST /session/97cf7a81-37ce-4ac4-bd05-4d029612237e/element
```



Write Test cases

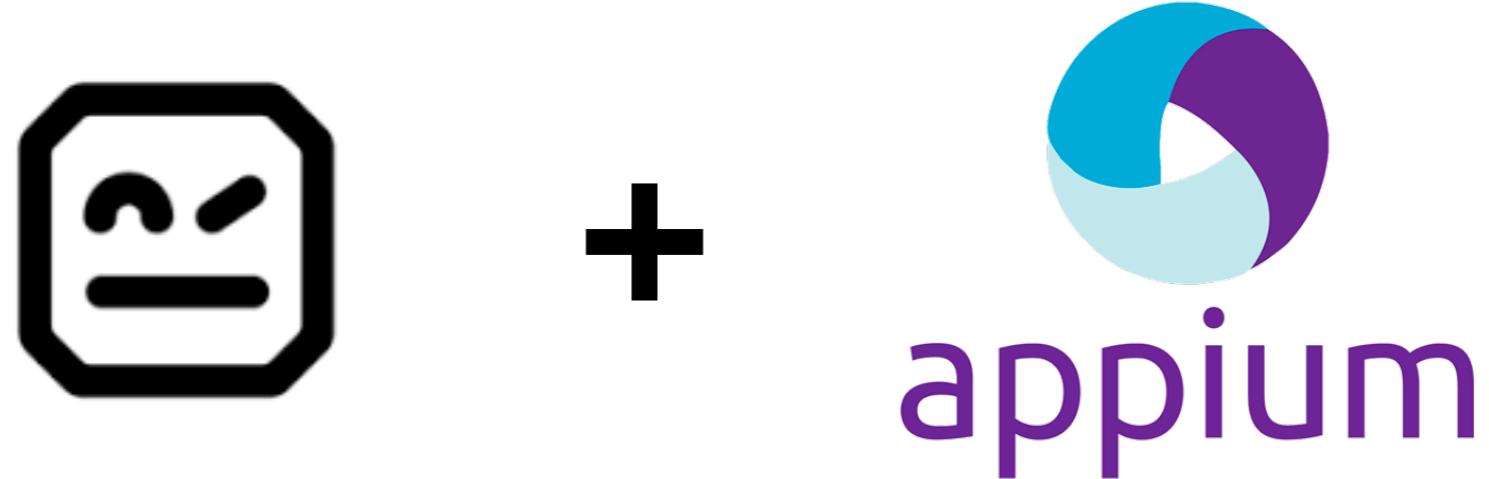


Working with Robot Framework



<https://robotframework.org/>





<https://github.com/serhatbolsu/robotframework-appiumlibrary>



Install Appium Library

```
$pip install -U robotframework
```

```
$pip install -U robotframework-appiumlibrary
```

<https://robotframework.org/>



Appium Library keywords

AppiumLibrary ☺

x

Keywords (115) +

- Activate Application
- Background App
- Background Application
- Capture Page Screenshot
- Clear Text
- Click A Point
- Click Button
- Click Element
- Click Element At Coordinates
- Click Text
- Close All Applications
- Close Application
- Delete File
- Drag And Drop
- Element Attribute Should Match

Library version: 2.0.0
Library scope: GLOBAL

Introduction

AppiumLibrary is a Mobile App testing library for Robot Framework.

Locating or specifying elements

All keywords in AppiumLibrary that need to find an element on the page take an argument, either a locator or an element. A locator is a string that describes how to locate an element using a syntax specifying different location strategies. An element holds a WebElement instance, which is a representation of the element.

Using locators

By default, when a locator is provided, it is matched against the key attributes of the particular element. The attribute is `id` for all elements and locating elements is easy using just the `id`. For example:

```
Click Element    id=my_element
```

New in AppiumLibrary 1.4, `id` and `xpath` are not required to be specified, however `xpath` should start with a locator as explained below.

<https://serhatbolsu.github.io/robotframework-appiumlibrary/AppiumLibrary.html>



Locator Elements

Strategy	Example	Description
identifier	Click Element / identifier=my_element	Matches by @id attribute
id	Click Element / id=my_element	Matches by @resource-id attribute
accessibility_id	Click Element / accessibility_id=button3	Accessibility options utilize.
xpath	Click Element / xpath=//UITableView/UIATableCell/UIAButton	Matches with arbitrary XPath
class	Click Element / class=UIAPickerWheel	Matches by class
android	Click Element / android=UiSelector().description('Apps')	Matches by Android UI Automator
ios	Click Element / ios=.buttons().withName('Apps')	Matches by iOS UI Automation
nsp	Click Element / nsp=name=="login"	Matches by iOSNsPredicate
chain	Click Element / chain=XCUIElementTypeWindow[1]/*	Matches by iOS Class Chain
css	Click Element / css=.green_button	Matches by css in webview
name	Click Element / name=my_element	Matches by @name attribute

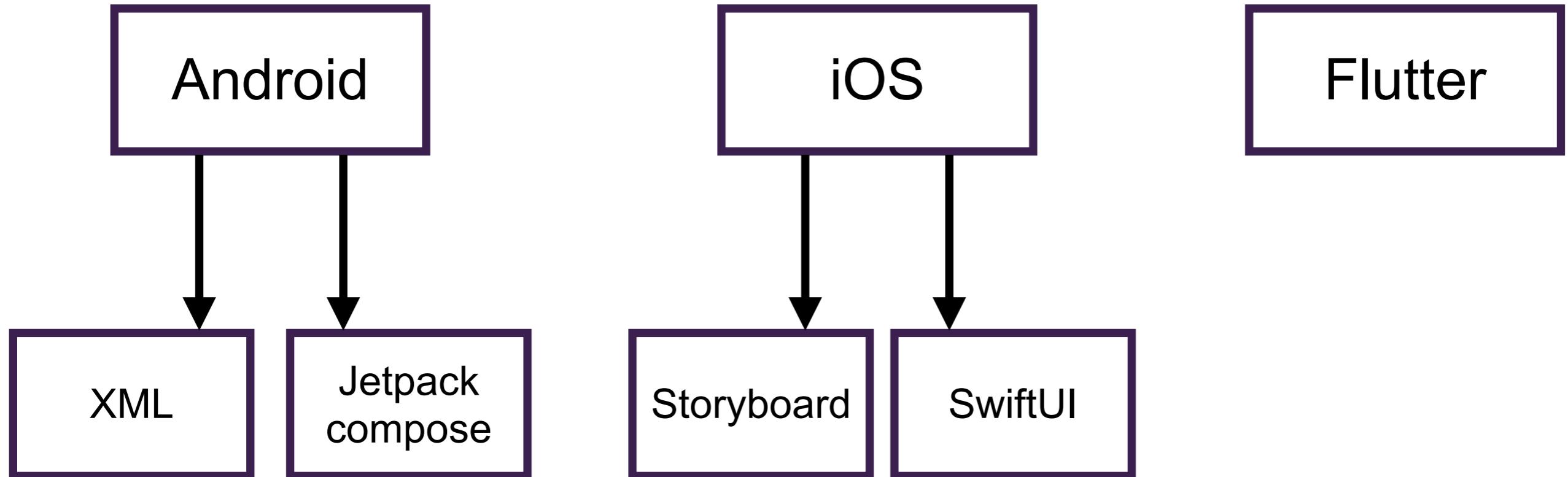
<https://serhatbolsu.github.io/robotframework-appiumlibrary/AppiumLibrary.html>



Write your tests



Target App with UI Test

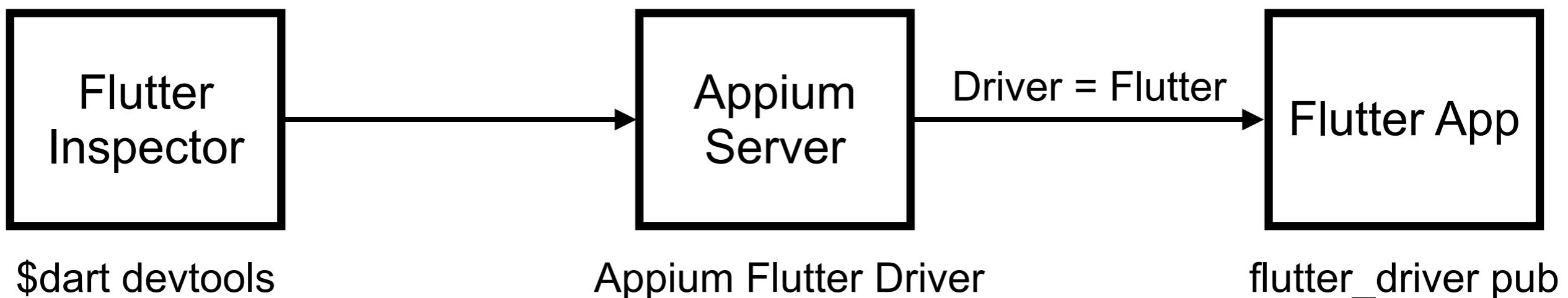


Appium for Flutter App



Appium with Flutter

Install via npm (required Node.js)



<https://github.com/appium/appium-flutter-driver>



Appium Server

Install Appium Flutter Driver

```
$appium driver install  
--source=npm appium-flutter-driver
```

<https://github.com/appium/appium-flutter-driver>



List of Appium driver

\$appium driver list

```
✓ Listing available drivers
- uiautomator2@2.29.2 [installed (npm)]
- flutter@2.0.0 [installed (npm)]
- xcuitest [not installed]
- mac2 [not installed]
- espresso [not installed]
- safari [not installed]
- gecko [not installed]
- chromium [not installed]
```

\$appium driver install flutter



Flutter App

pubspec.yaml

```
dev_dependencies:  
  flutter_driver:  
    sdk: flutter  
  
  flutter_test:  
    sdk: flutter
```

main.dart

```
import 'package:flutter_driver/flutter_driver_extension.dart';  
  
void main() {  
  
  enableFlutterDriverExtension();  
  
  runApp(DevicePreview(  
    enabled: !kReleaseMode,  
    builder: (context) => const MyApp(),  
  ));  
}
```

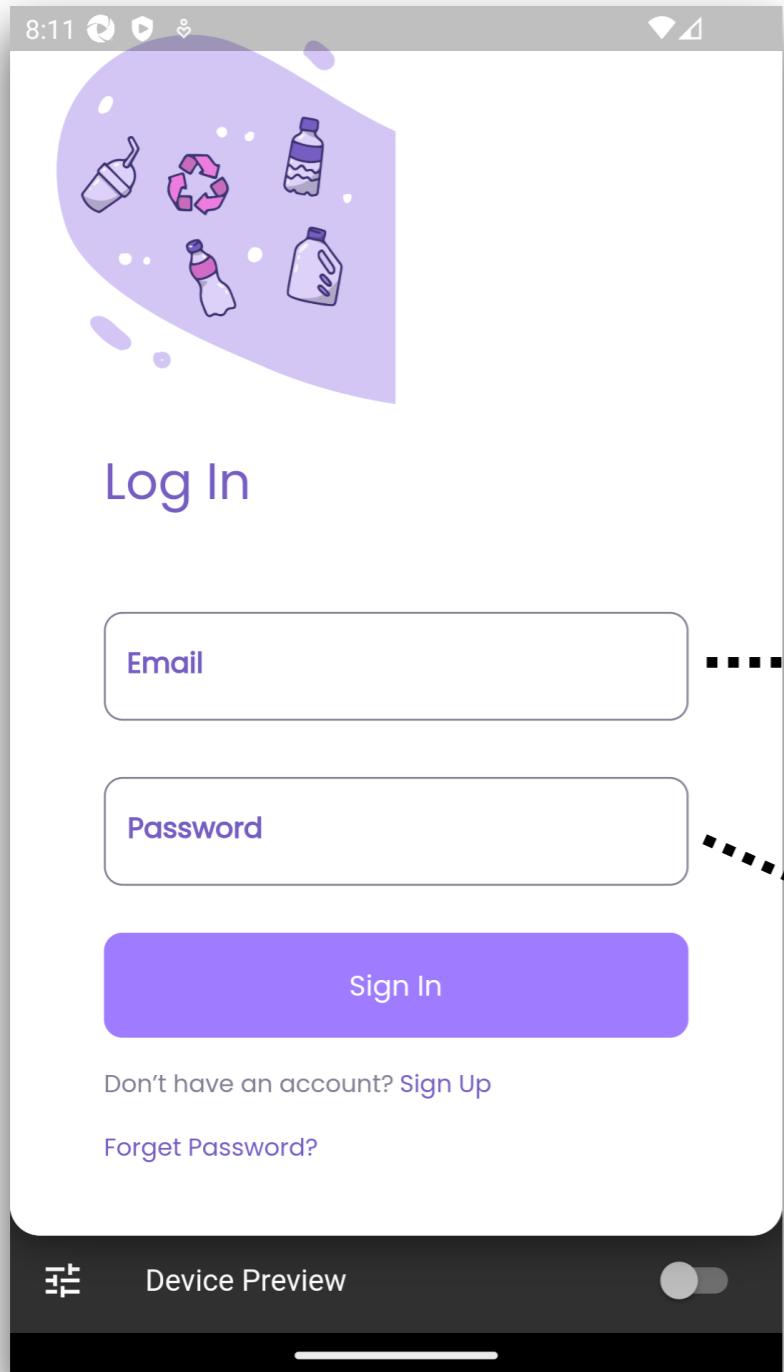


Flutter App Locator

Key (default)
Text
Semantics
Tooltip
Type



Flutter App Locator



```
TextField(  
  key: Key('email_key'),
```

```
TextField(  
  key: Key('password_key'),
```



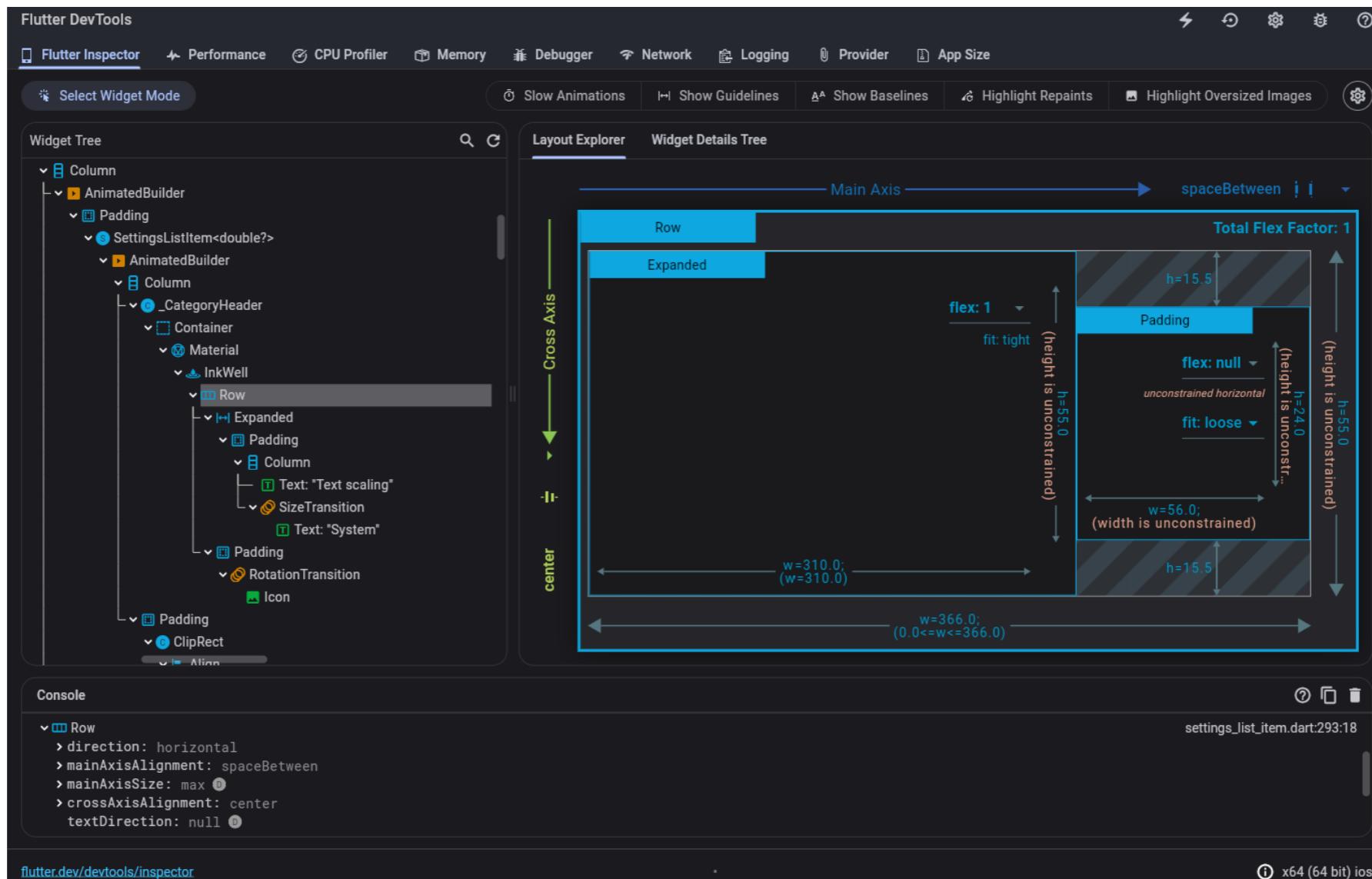
Start Flutter App

\$flutter run



Flutter Inspector

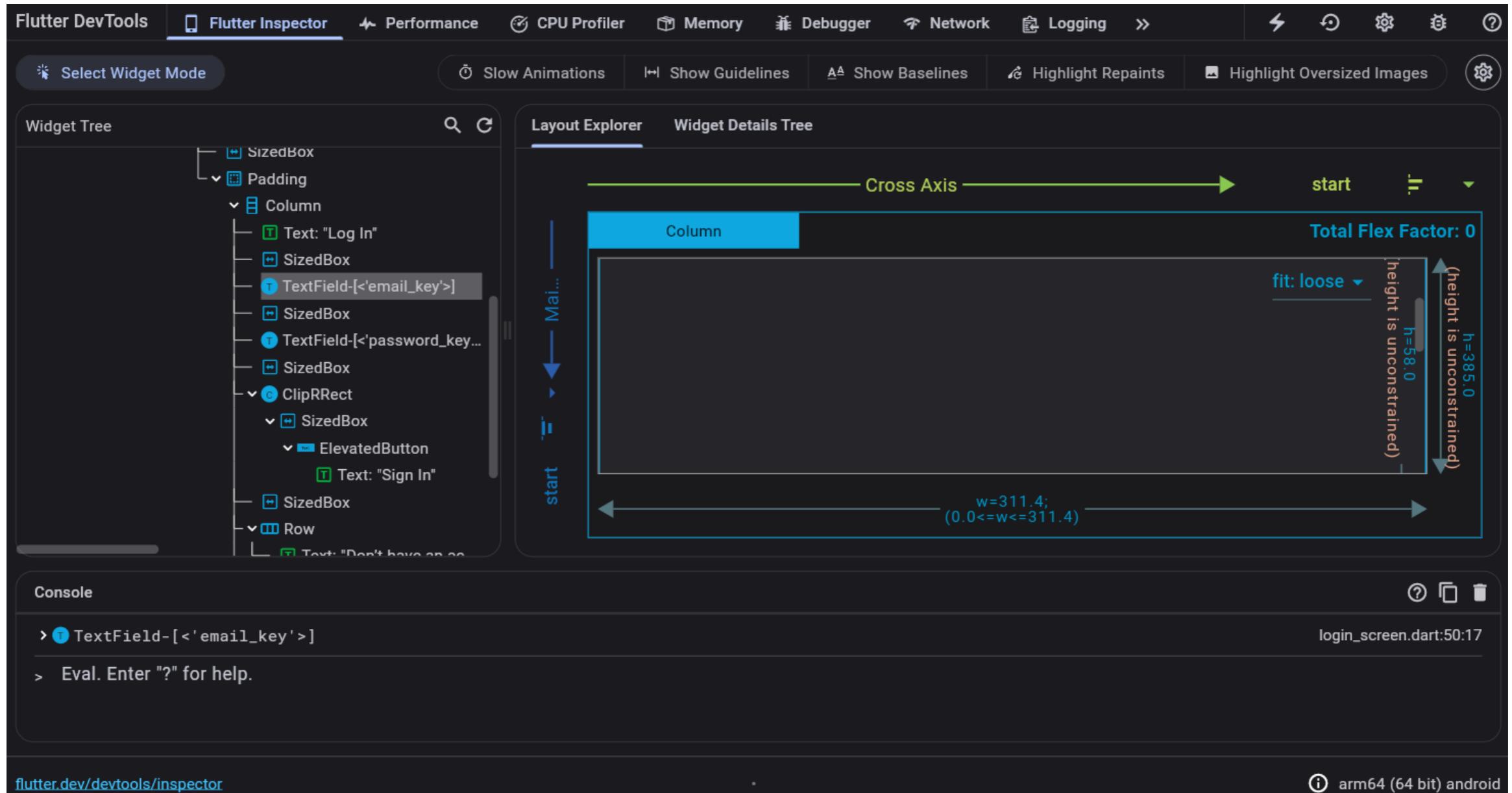
\$dart devtools



<https://docs.flutter.dev/tools/devtools/inspector>



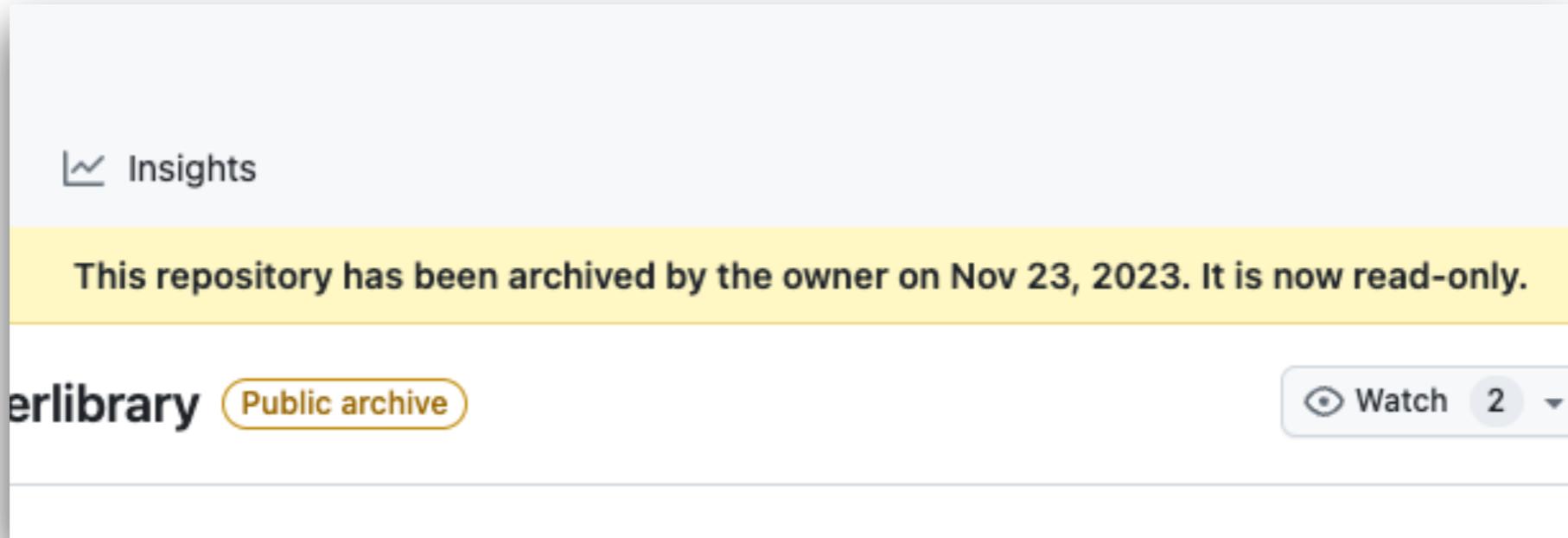
Flutter Inspector



AppiumFlutter Library

Working with Robot framework

```
$pip install -U robotframework-appiumflutterlibrary
```



<https://github.com/igortavtib/robotframework-appiumflutterlibrary>



Write test case

*** Settings ***

Library AppiumFlutterLibrary

*** Variables ***

```
 ${REMOTE_URL}    http://127.0.0.1:4723
 ${platformName}   Android
 ${app}           ${CURDIR}/../../demo-app/flutter.apk
 ${deviceName}     id/name
 ${automationName} flutter
```

*** Test Cases ***

Test case name

```
  Open Application    ${REMOTE_URL}
    ...  platformName=${platformName}
    ...  app=${app}  deviceName=${deviceName}
    ...  automationName=${automationName}
```

```
  Wait For Element  key=email_key
  Click Element    key=email_key
  Input Text       key=email_key  demo@admin.com
```

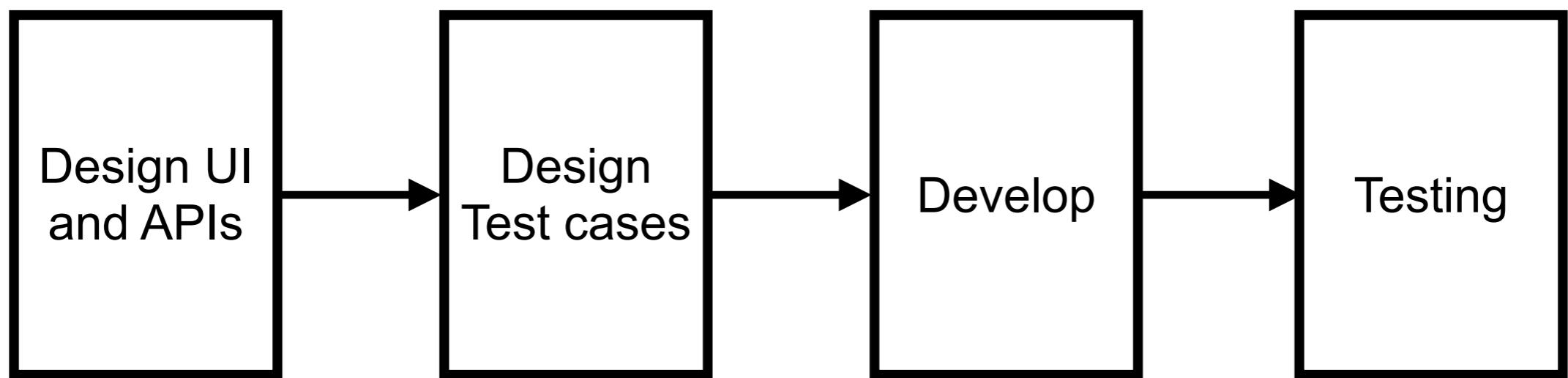
<https://igortavtib.github.io/robotframework-appiumflutterlibrary/AppiumFlutterLibrary.html>



Write test case with NodeJS



Improve Process

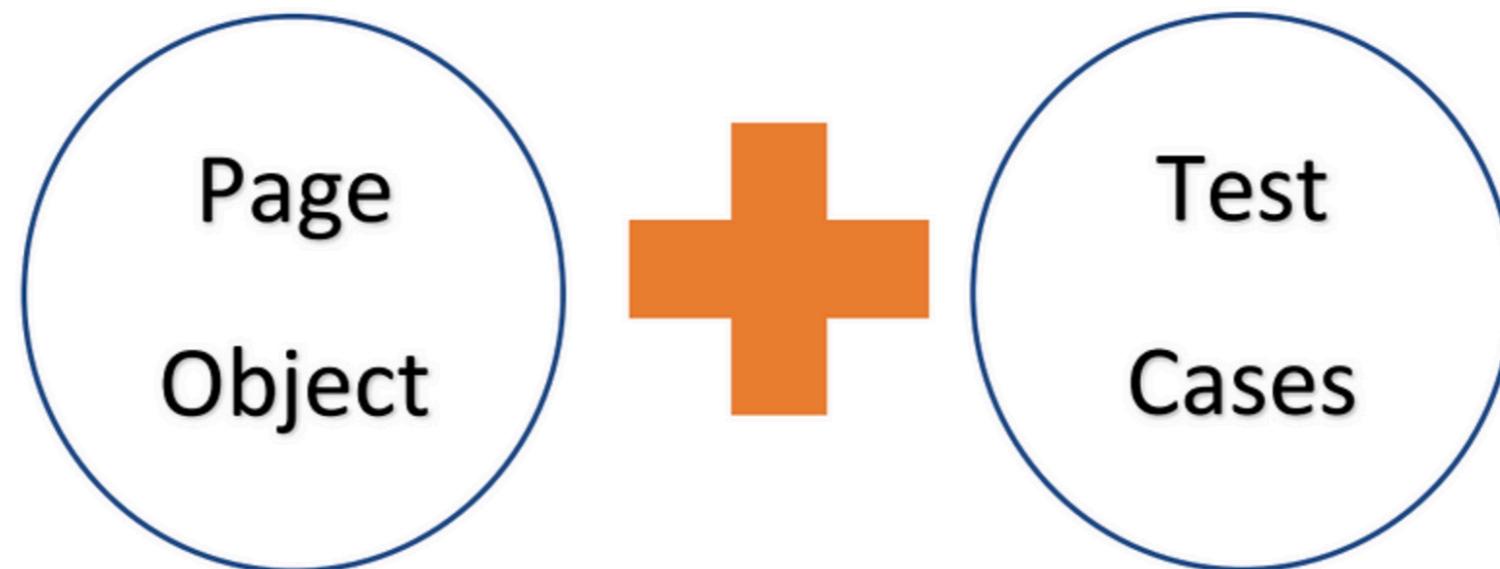


Page Object Pattern

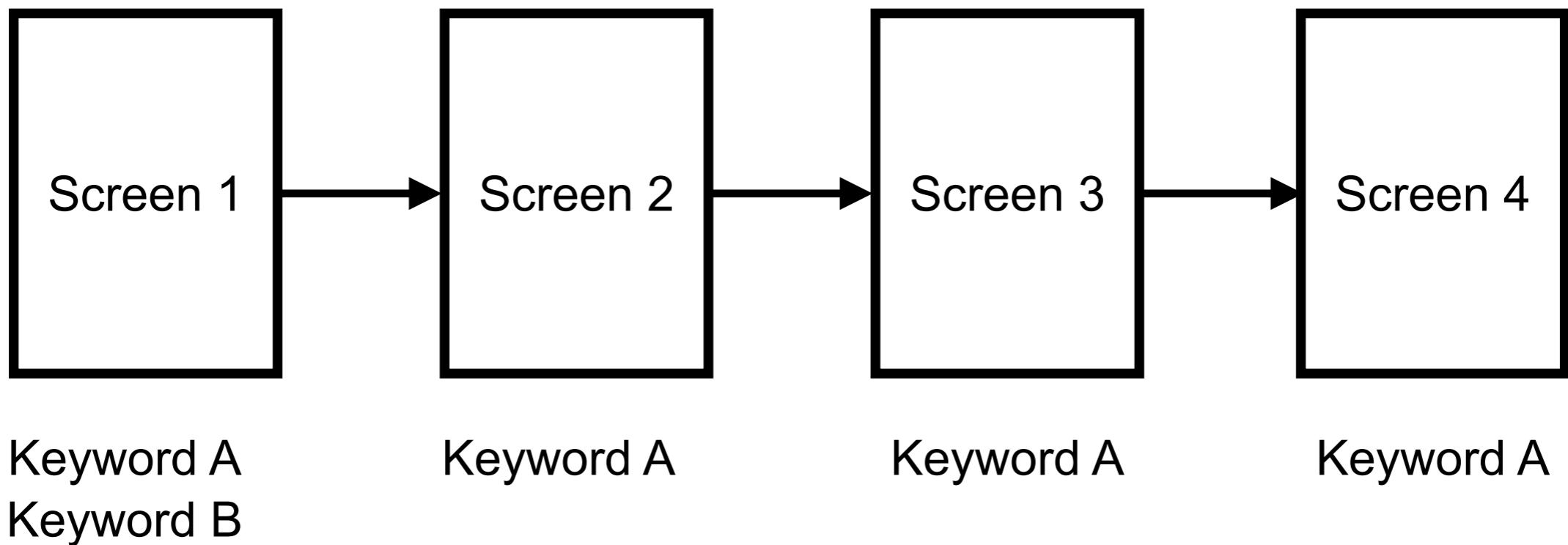


Page Object Pattern

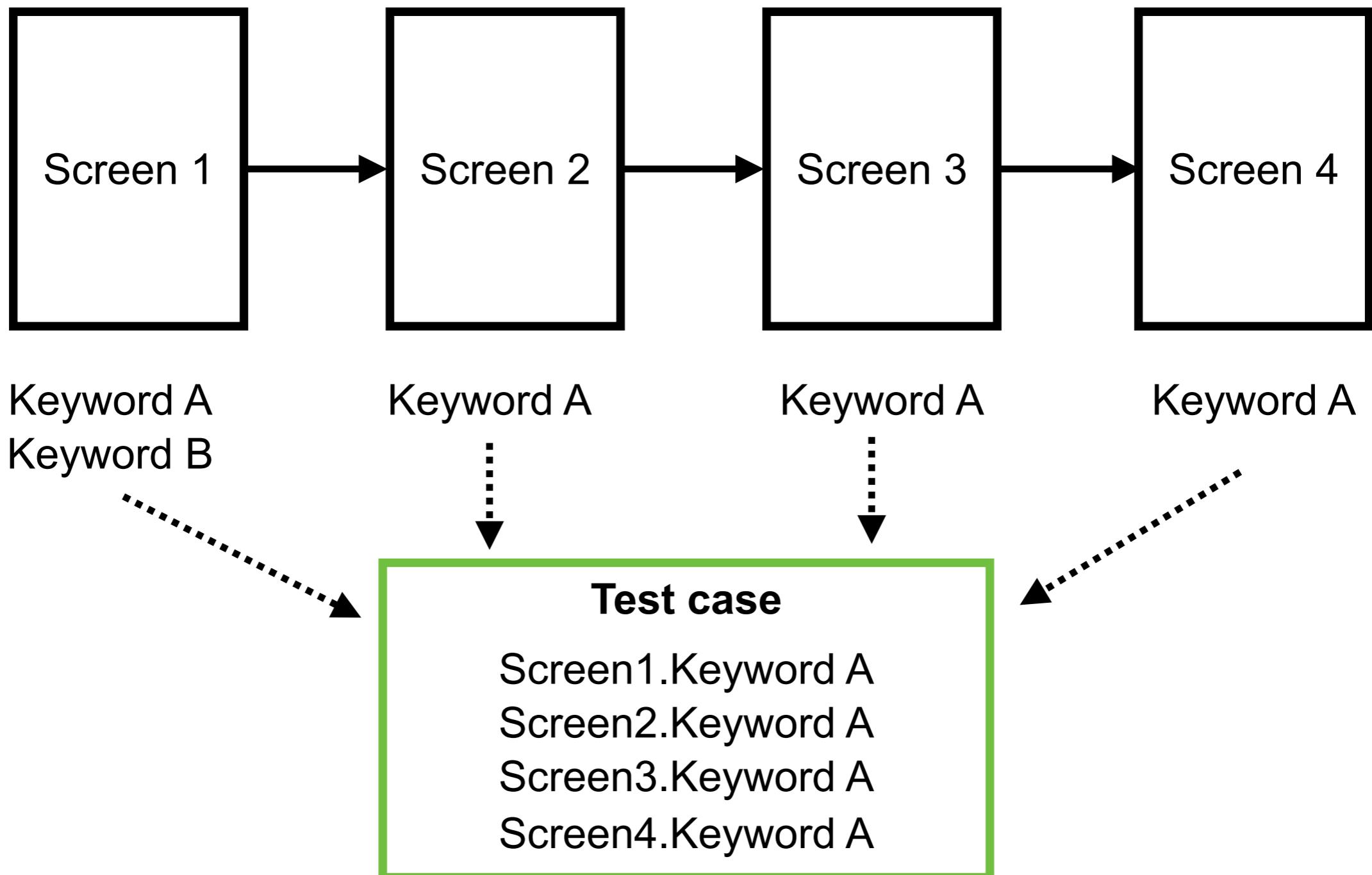
Maintainable test cases
Reduce code duplication
Working as a team



Use Page Object Pattern



Use Page Object Pattern

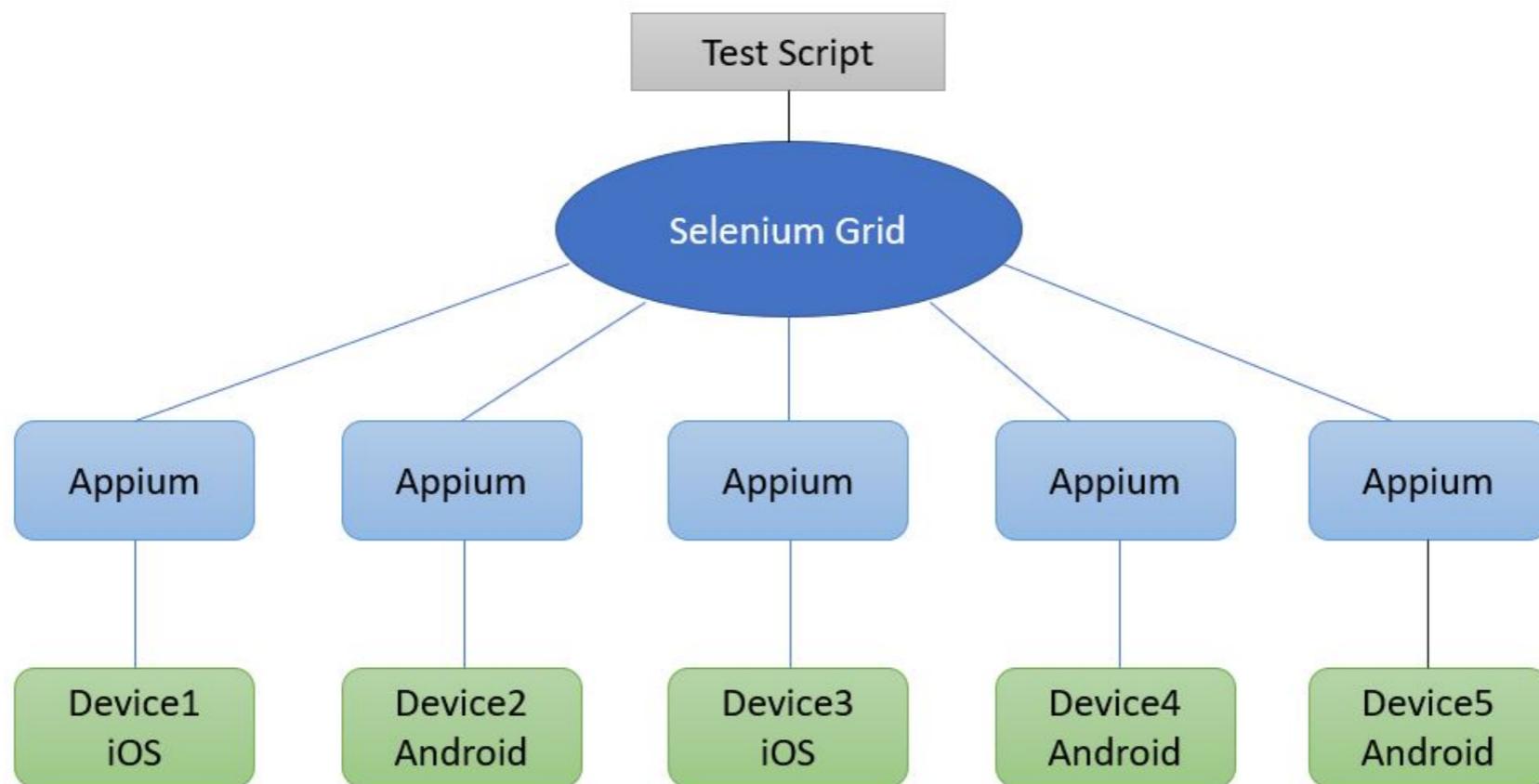


Make it Fast



Appium Grid

Proxy server that allow to run parallel tests
on multiple devices simultaneously



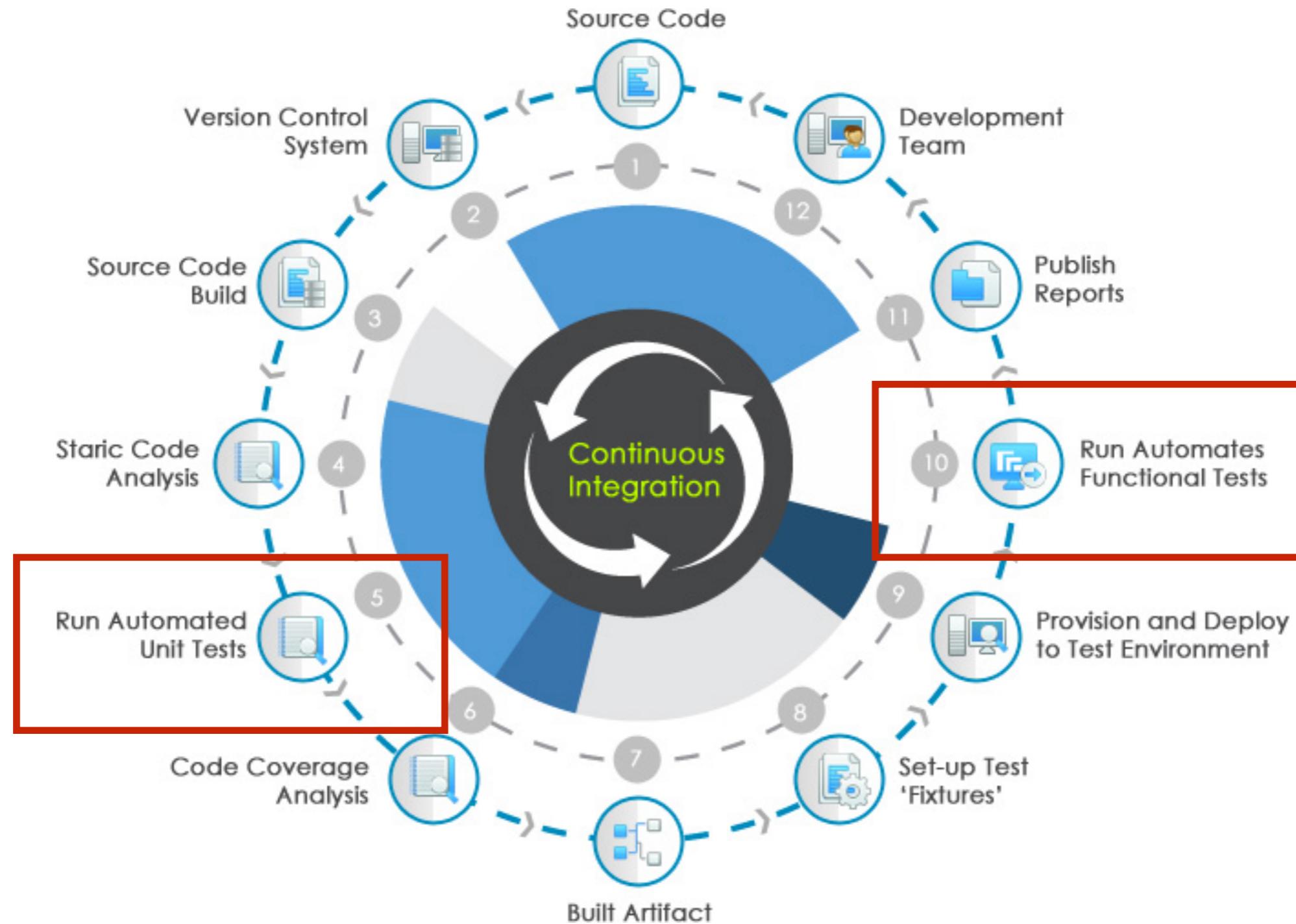
<https://appium.io/docs/en/2.1/guides/grid/>



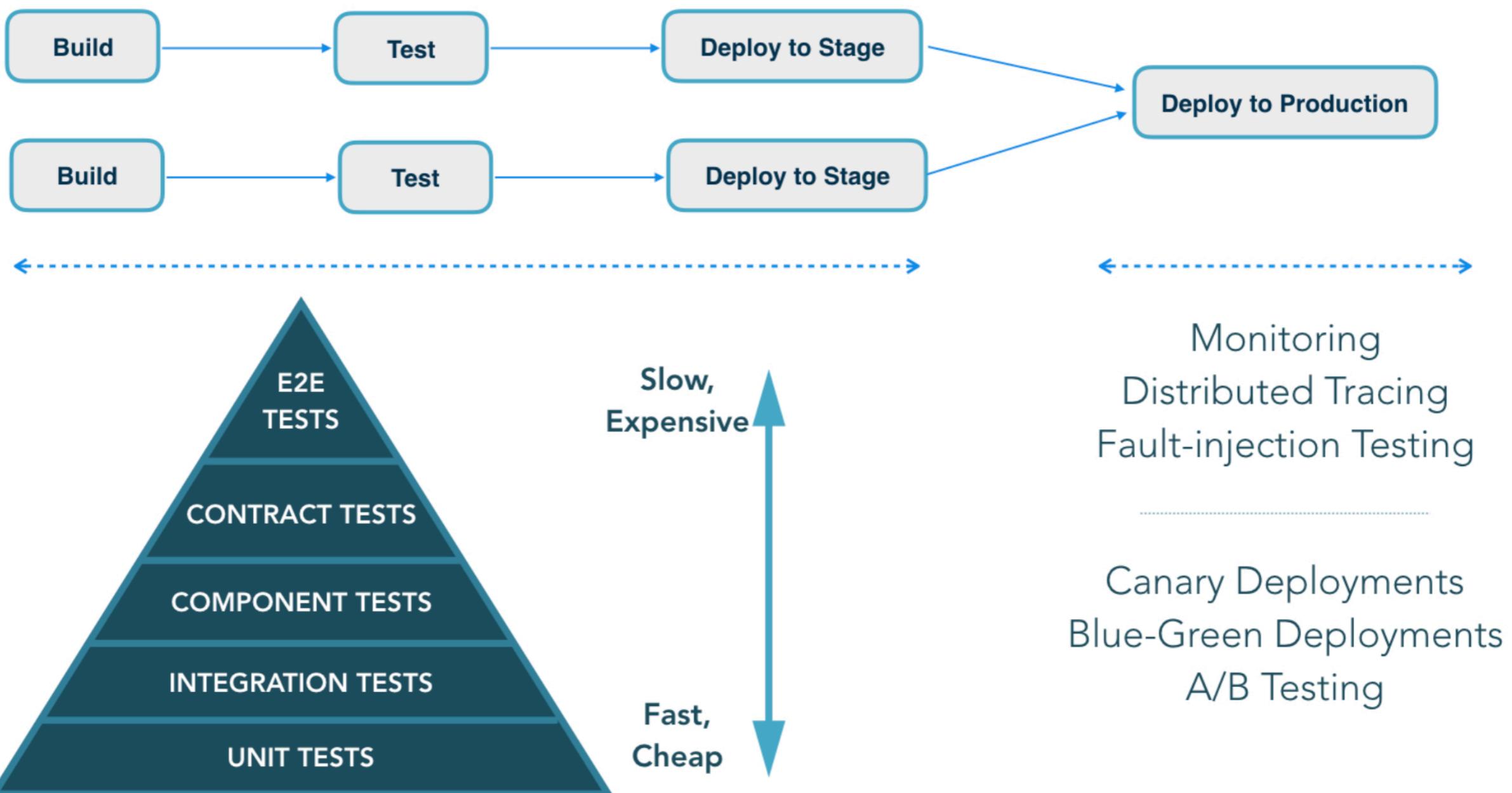
Continuous Integration



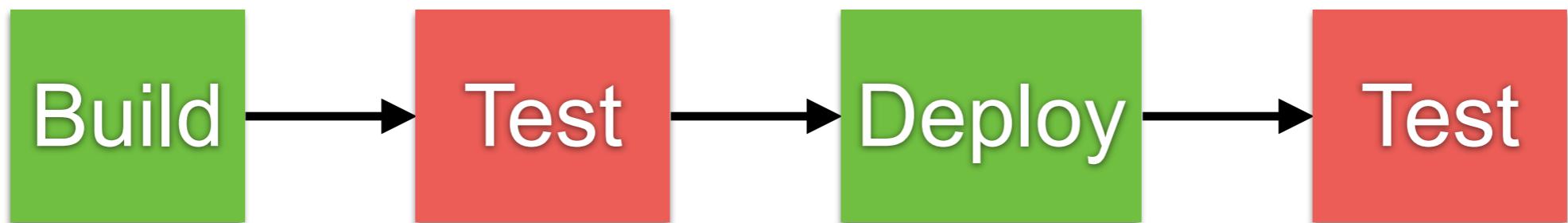
Continuous integration



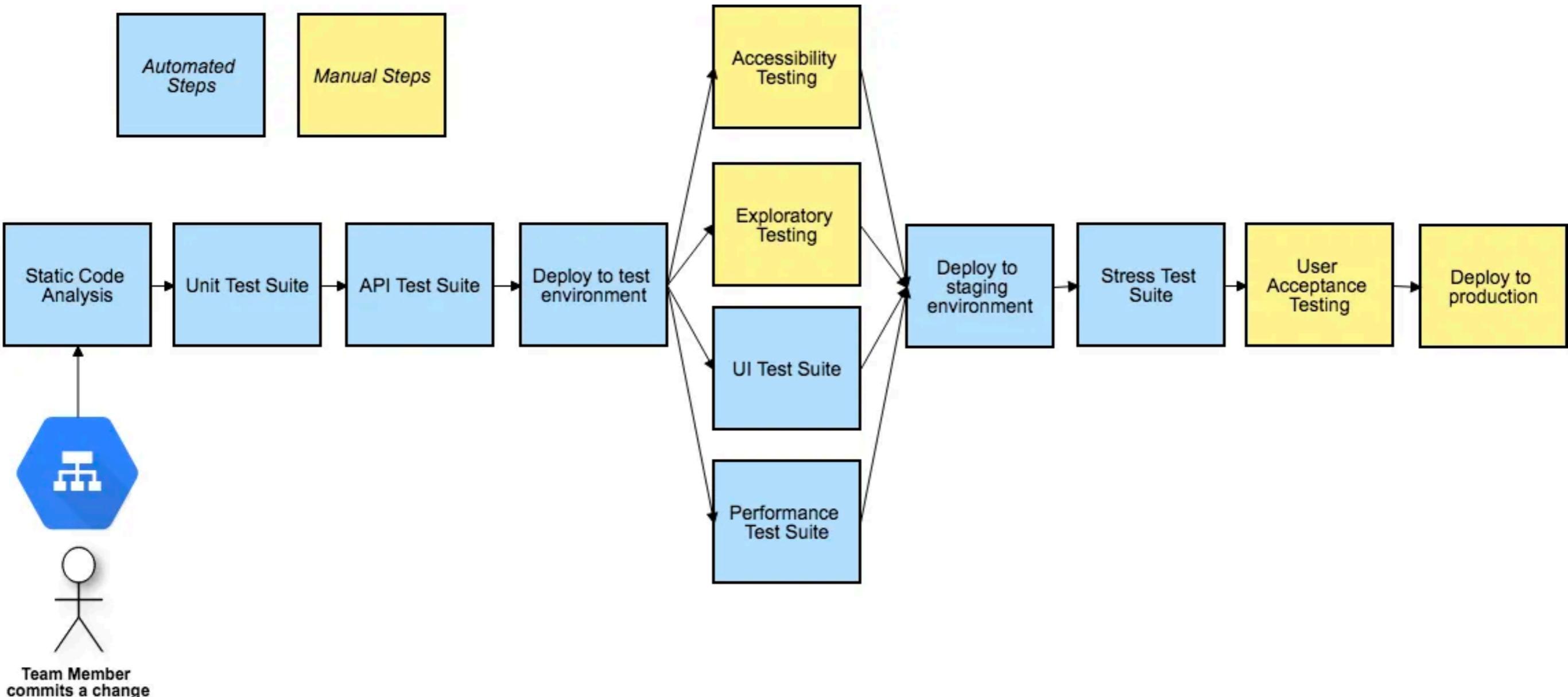
Test strategy



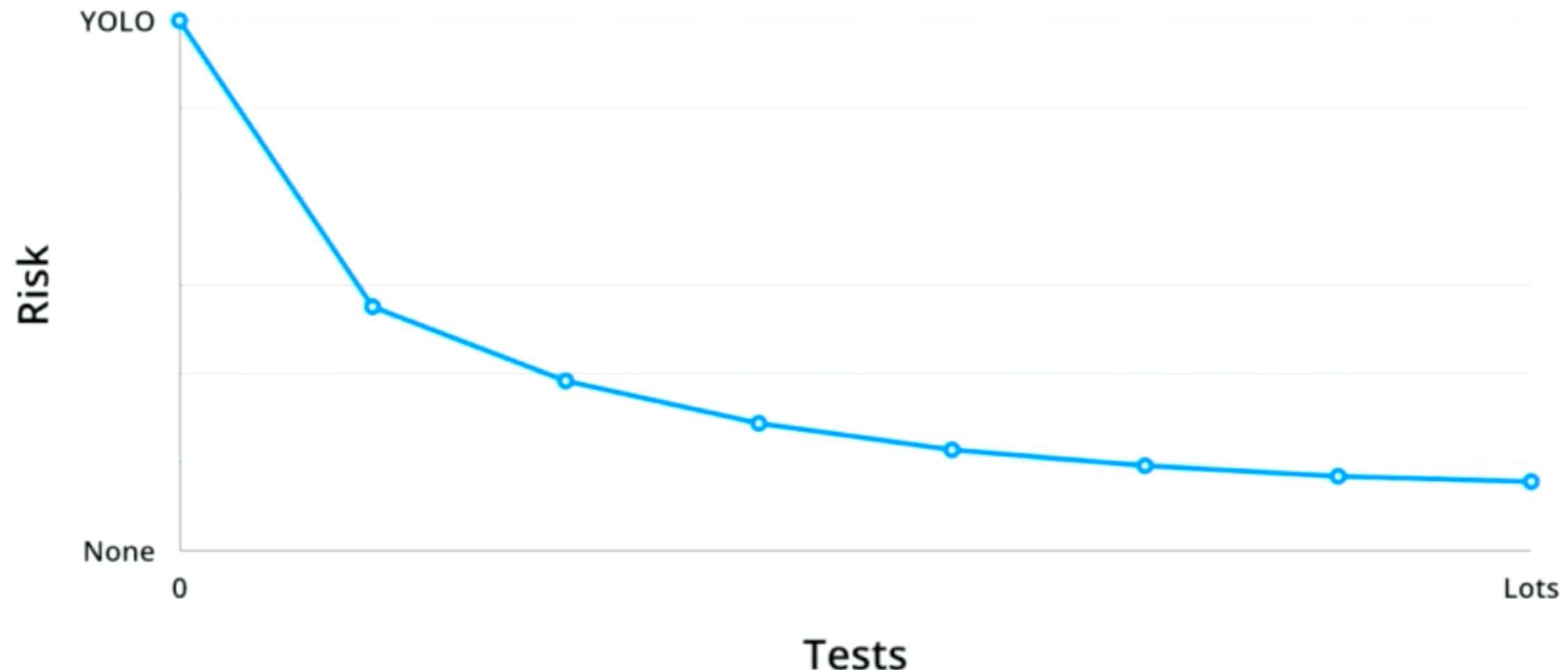
Design your pipeline



Design your pipeline/process



Reduce risk with tests



Start with your journey

