

Basic of Android Testing





Somkiat Puisungnoen

Update Info 1 View Activity Log 10+ ...

Timeline About Friends 3,138 Photos More

When did you work at Opendream? X

... 22 Pending Items

Post Photo/Video Live Video Life Event

What's on your mind?

Public Post

Intro

Software Craftsmanship

Software Practitioner at สยามชั่นนาฎกิจ พ.ศ. 2556

Agile Practitioner and Technical at SPRINT3r

Somkiat Puisungnoen 15 mins · Bangkok · ...

Java and Bigdata



Facebook somkiat.cc

Somkiat Home | ? ▾

Page Messages Notifications 3 Insights Publishing Tools Settings Help ▾

somkiat.cc
@somkiat.cc

Home Posts Videos Photos

Liked Following Share ...

+ Add a Button



**[https://github.com/up1/
workshop-basic-android-testing](https://github.com/up1/workshop-basic-android-testing)**



Agenda in 3 hours

Introduction of testing

Why we need to test ?

Types of tests

Testing pyramid concept

Android testing

Workshop (step-by-step)

Homework and assignment



Testing for Android app



Why we need to test ?

Help you to catch bugs

Develop features faster

Enforce modularity of your project



**But,
It's take time to learning and
practice !!**



Goals

How to **THINK** when and where
you should test



What you need to know ?

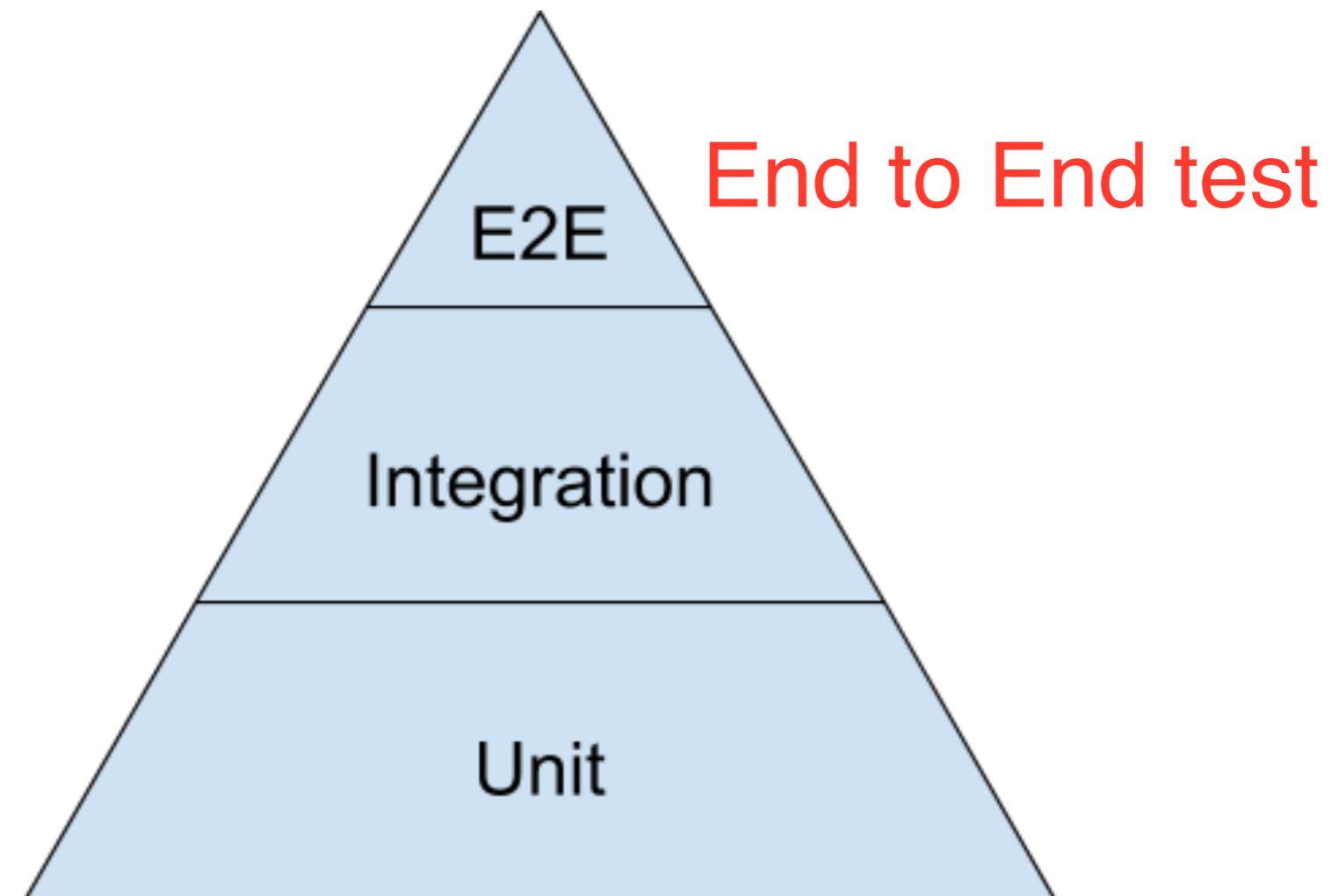
Android
Android Studio
JUnit 4
Espresso



Type of testing



Testing Pyramid



Android Testing

Android



Android Testing

Android

Java



Java run on JVM



JVM (Java Virtual Machine)



Run android need device



Build app -> Install to device -> Test



Android Testing

JVM

Device

JVM unit test

/src/test

Business logic with pure java code



Android Testing

JVM

Device

JVM unit test

Instrumentation unit
test

/src/test

/src/androidTest

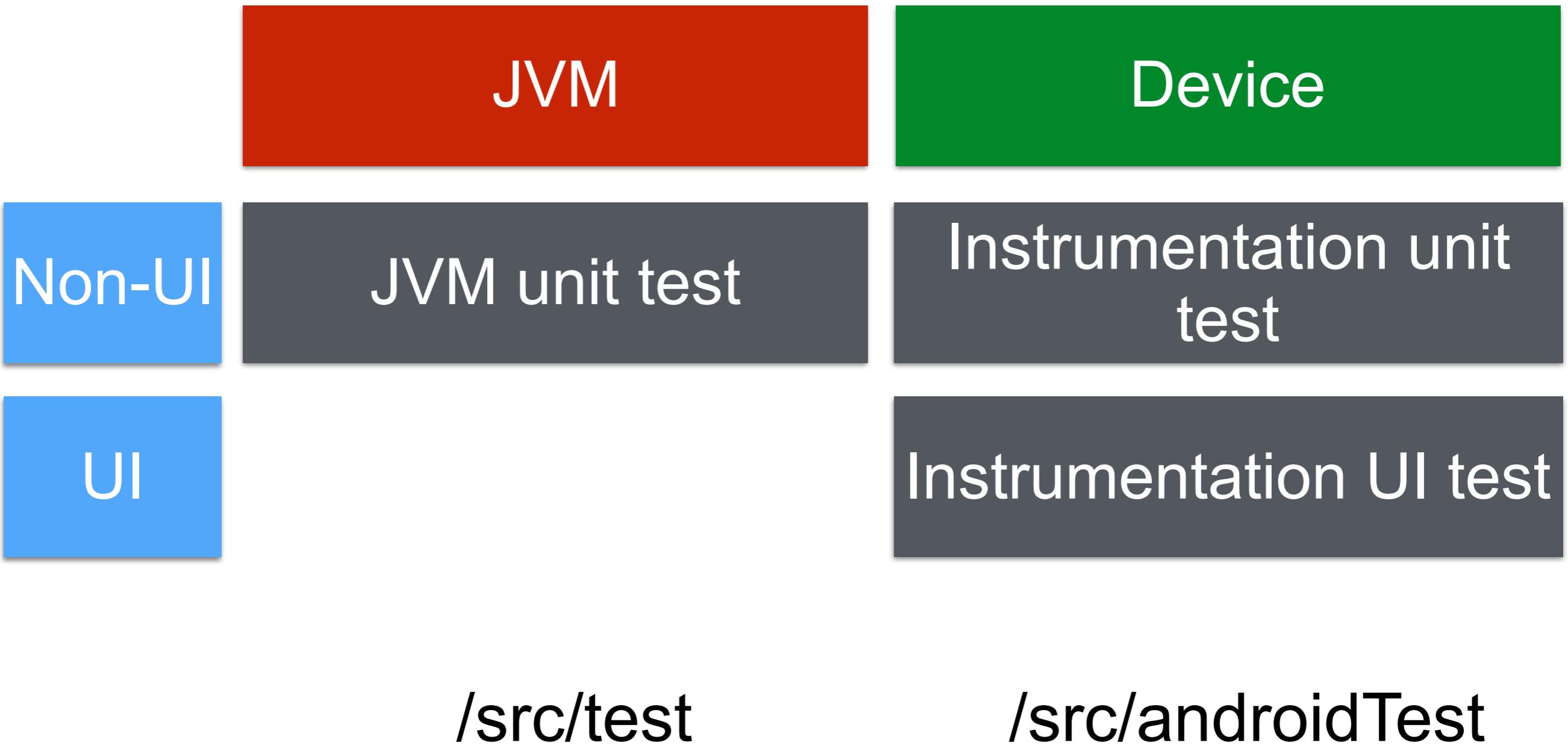
Working with Android specific code, you need run on device such as AssetManager, SharedPreference



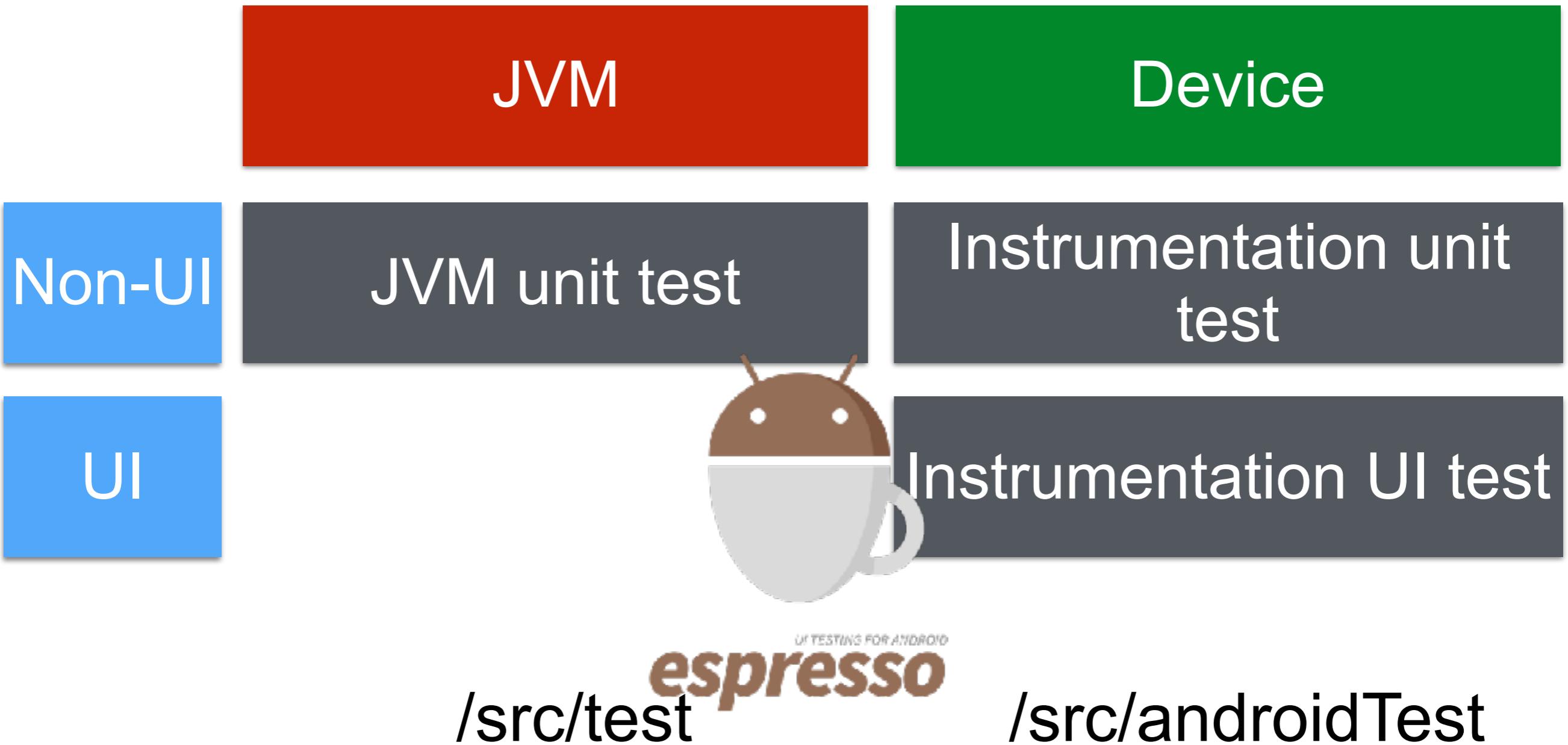
UI vs Non-UI



Android Testing



Android Testing



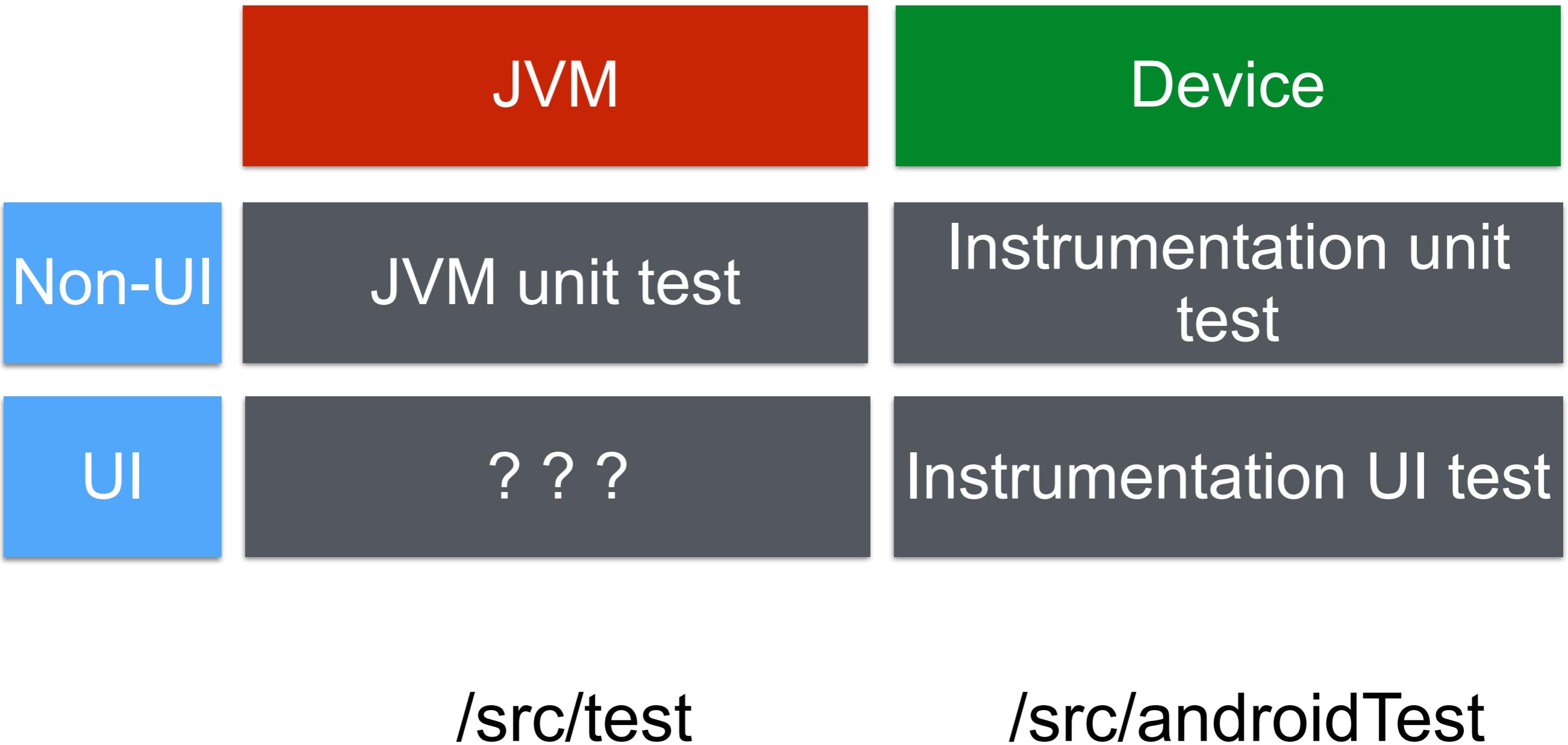
Resources

<https://developer.android.com/studio/test/index.html>

<https://developer.android.com/topic/libraries/testing-support-library/index.html#Espresso>



Android Testing



Android Testing

JVM

Device

Non-UI

JVM unit test

Instrumentation unit
test

UI

Robolectric and MVP

Instrumentation UI test

/src/test

/src/androidTest



Rule of thumb

Instrumentation tests are **slower** than JVM tests.

Try to separate the standard Java code from Android-dependent code.



Workshop with Testing

step-by-step to write tests

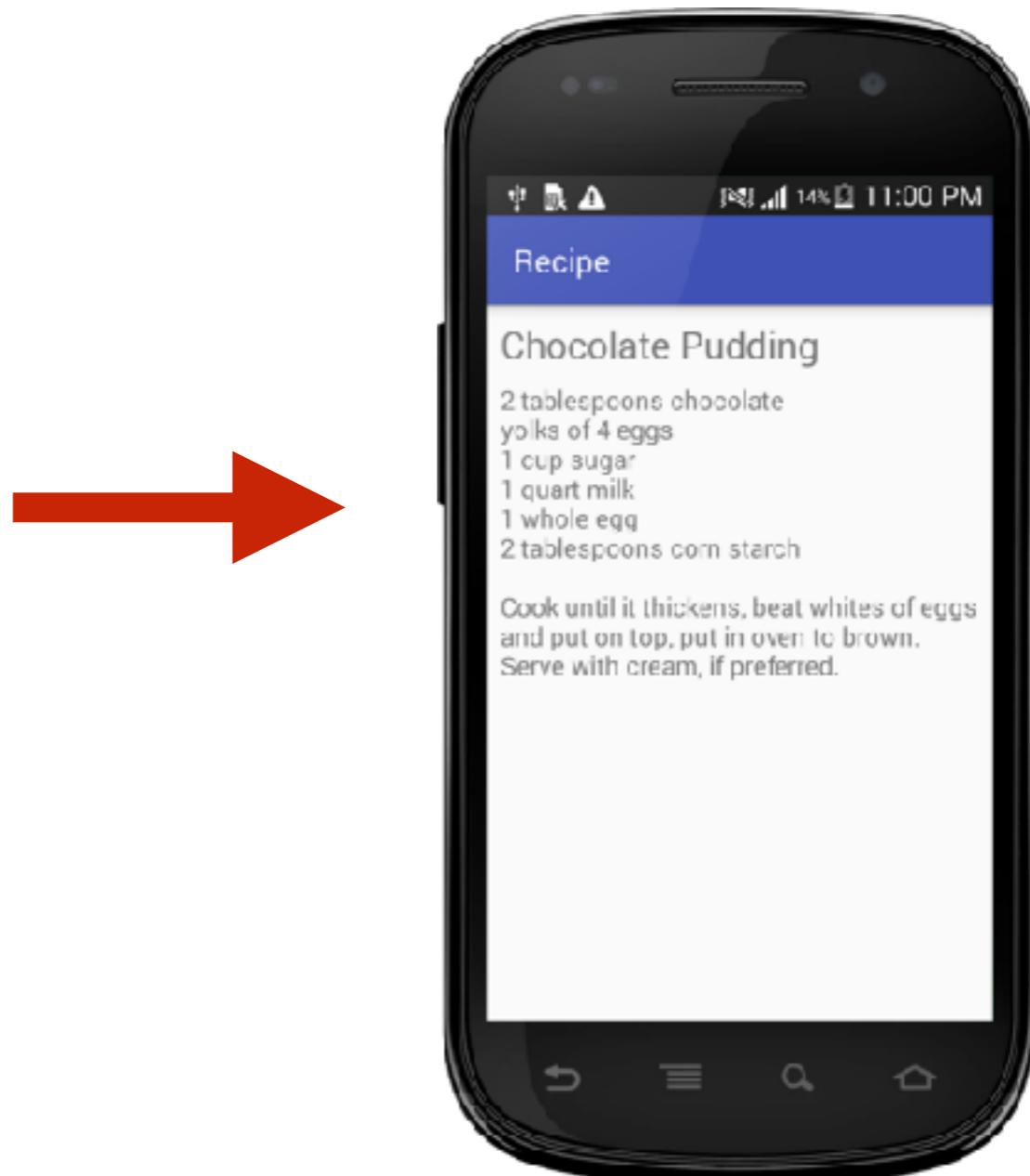


Recipe application

List of recipes



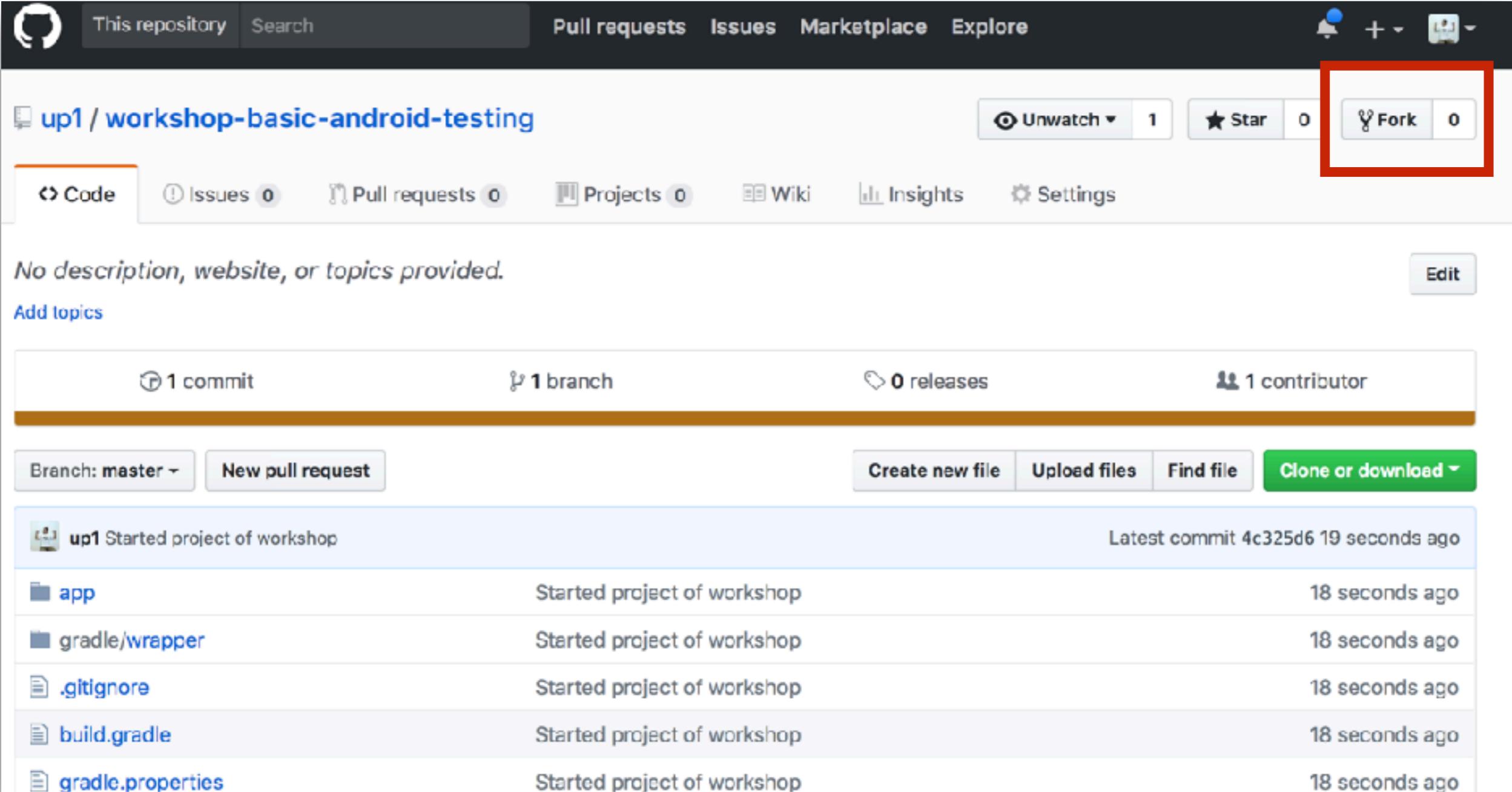
Detail of recipe



Prepare your project



1. Fork from Github repository



The screenshot shows a GitHub repository page for 'up1 / workshop-basic-android-testing'. The top navigation bar includes links for 'This repository', 'Search', 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. On the right side of the header, there are buttons for 'Unwatch' (with 1 watch), 'Star' (with 0 stars), and 'Fork' (with 0 forks). A red box highlights the 'Fork' button. Below the header, the repository name 'up1 / workshop-basic-android-testing' is displayed, along with tabs for 'Code', 'Issues 0', 'Pull requests 0', 'Projects 0', 'Wiki', 'Insights', and 'Settings'. A note says 'No description, website, or topics provided.' with an 'Edit' link. There is also an 'Add topics' link. Below this, summary statistics show '1 commit', '1 branch', '0 releases', and '1 contributor'. A dropdown menu for 'Branch: master' and a 'New pull request' button are also present. At the bottom, a list of files shows they were all 'Started project of workshop' 18 seconds ago, with the latest commit being '4c325d6 19 seconds ago'.

File	Message	Time
app	Started project of workshop	18 seconds ago
gradle/wrapper	Started project of workshop	18 seconds ago
.gitignore	Started project of workshop	18 seconds ago
build.gradle	Started project of workshop	18 seconds ago
gradle.properties	Started project of workshop	18 seconds ago

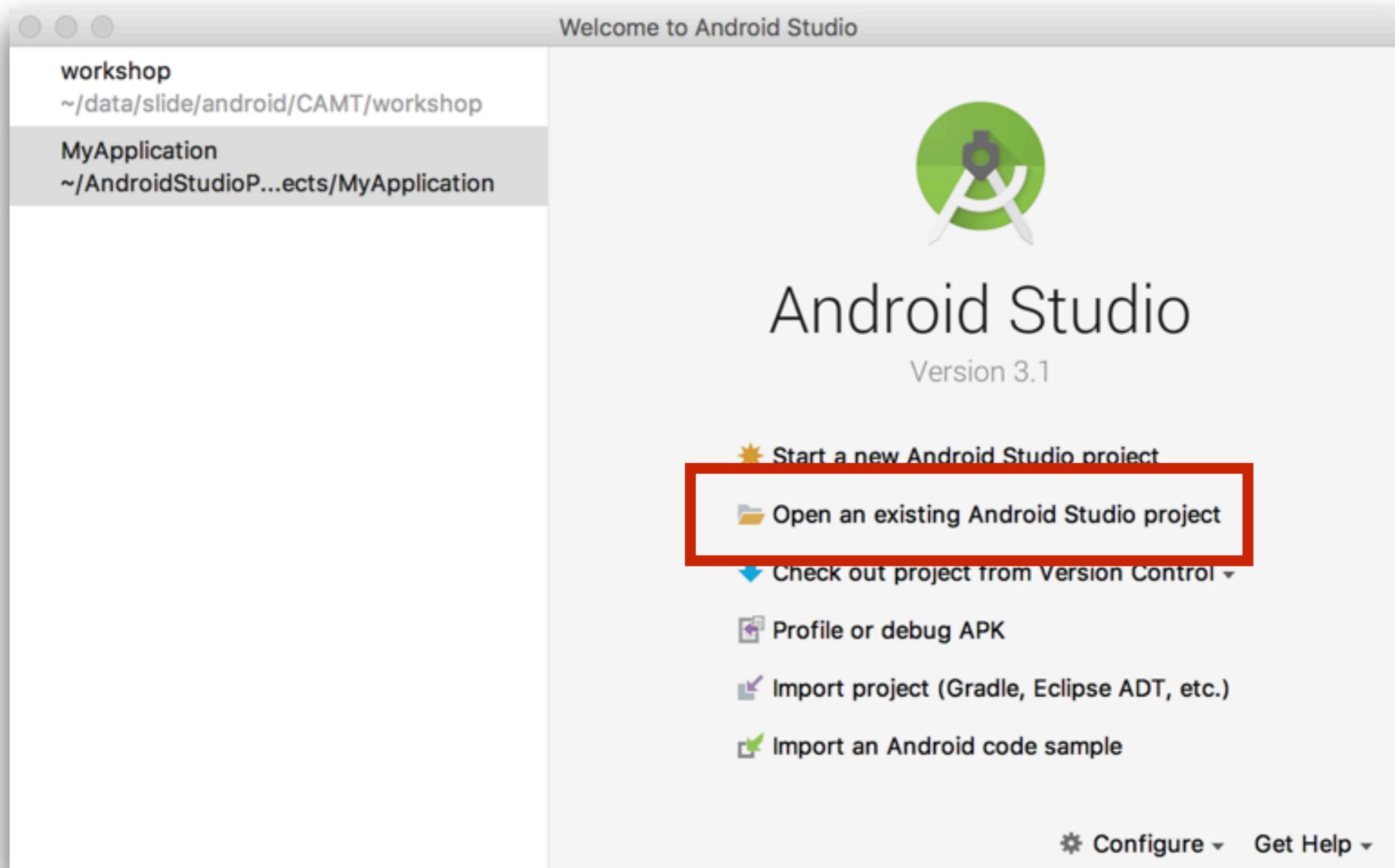


2. Clone from your repository

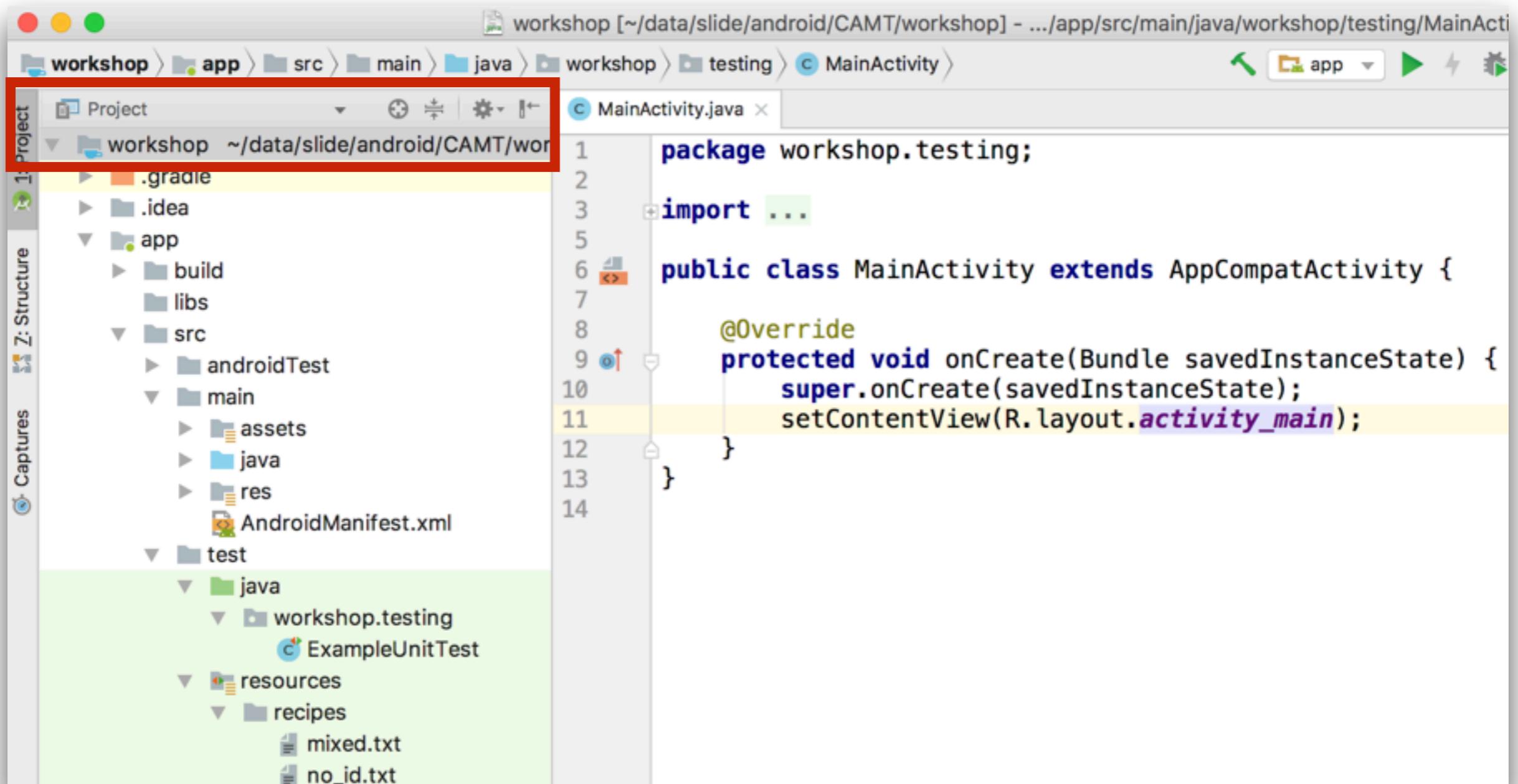
```
$git clone https://github.com/  
<username>/workshop-basic-android-  
testing
```



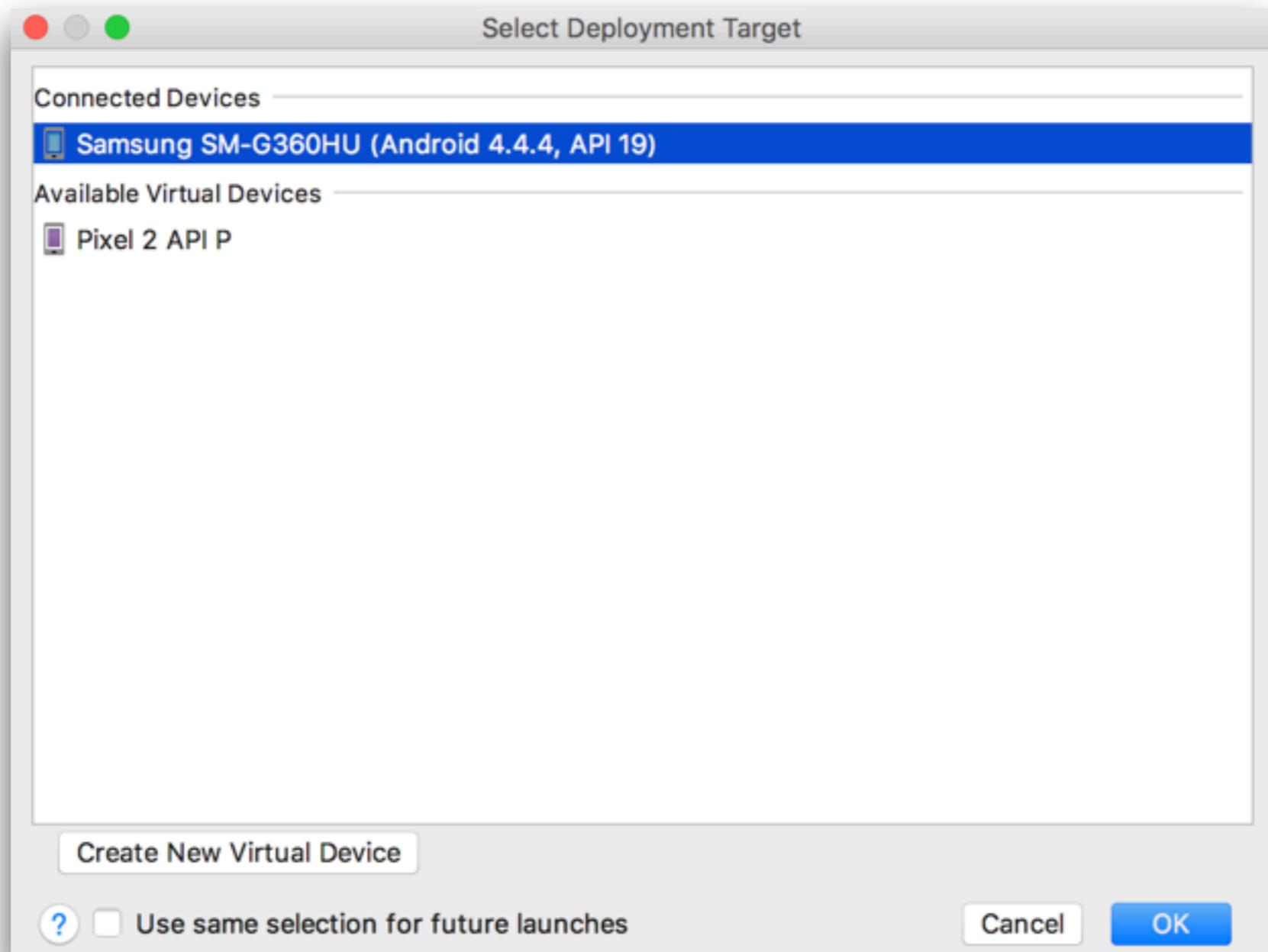
3. Import to Android Studio



4. Switch to project view



5. Try to run on device/emulator



Ready to start



Rule of workshop

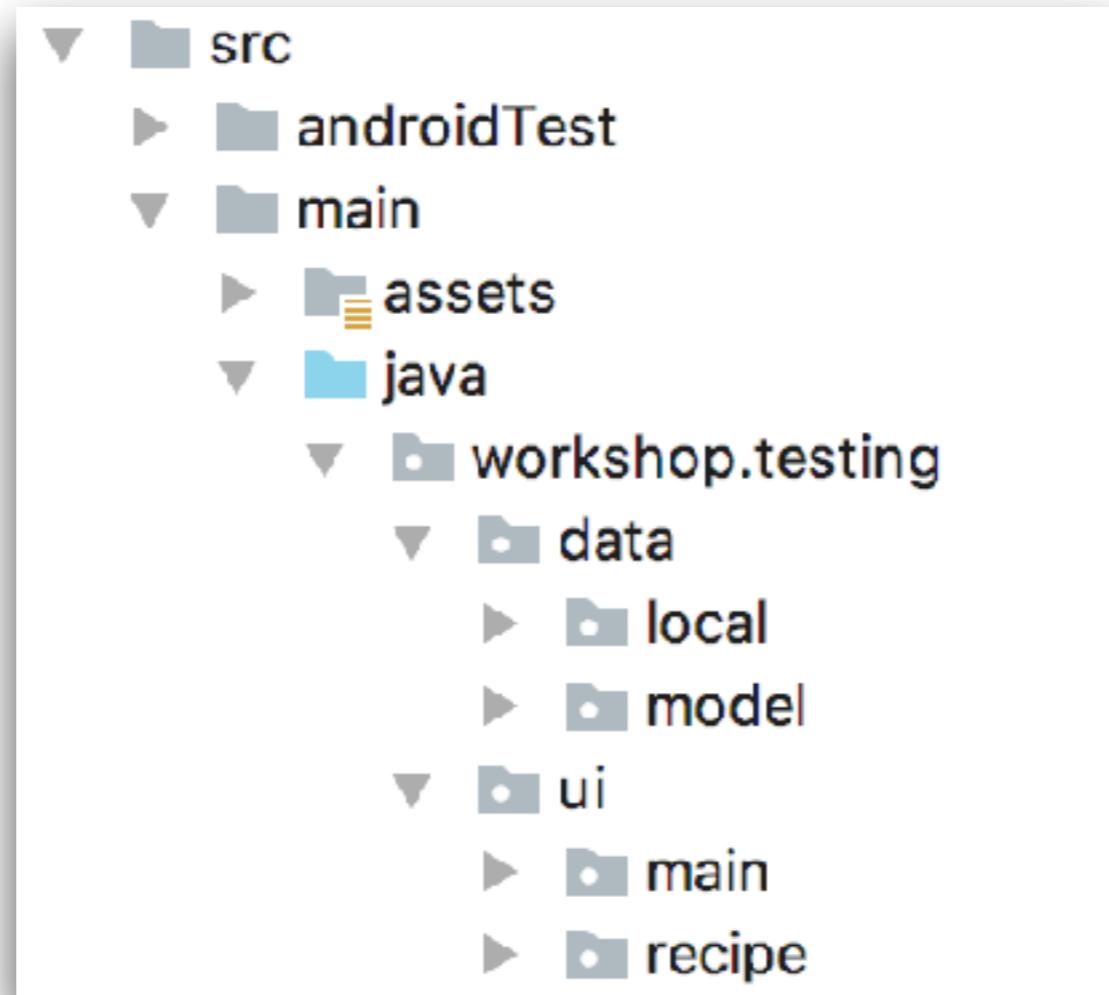
One test case per commit and push to
Github repository



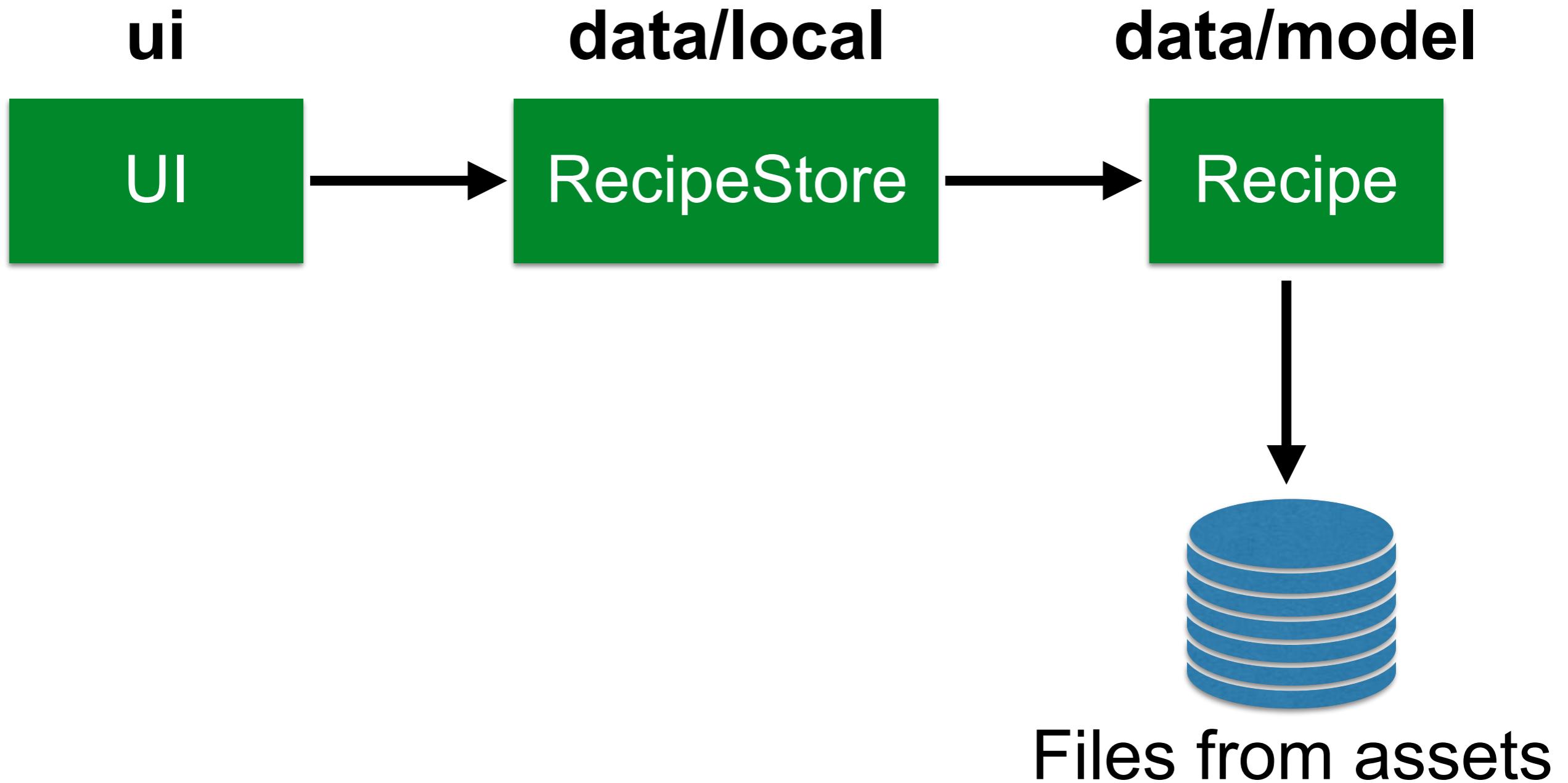
Let's start



Project structure



Project structure



Test structure

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Test structure

Test class name is a group of tests

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Test structure

Test annotation of JUnit 4 use to define the method as a test case

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Test structure

Arrange section to setup data and states of test case

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Test structure

Act section to call the target method to check and verify behavior

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Test structure

Assert section to check the result as we expected or not

```
public class RecipeTest {  
  
    @Test  
    public void water() {  
        //Arrange  
        InputStream stream  
            = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
        // Act  
        Recipe recipe = Recipe.readFromStream(stream);  
  
        // Assert  
        assertNotNull(recipe);  
        assertEquals( expected: "water", recipe.id);  
        assertEquals( expected: "Water", recipe.title);  
        assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
            , recipe.description);  
    }  
}
```



Check code coverage



Code coverage

A tool to measure how much of your code is covered by tests that break down into classes, methods and lines.



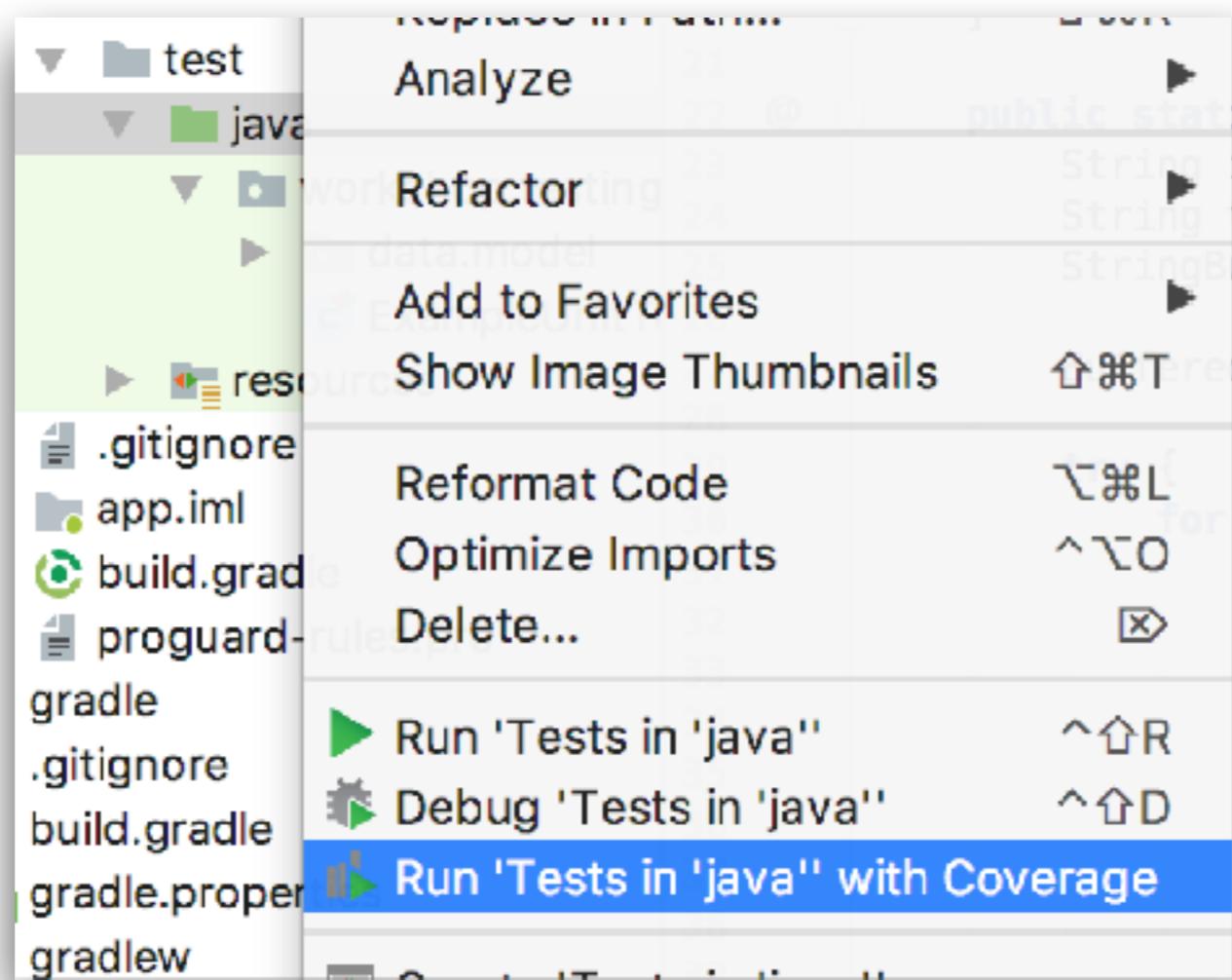
Code coverage

But 100% of code coverage does not mean that your code is 100% correct



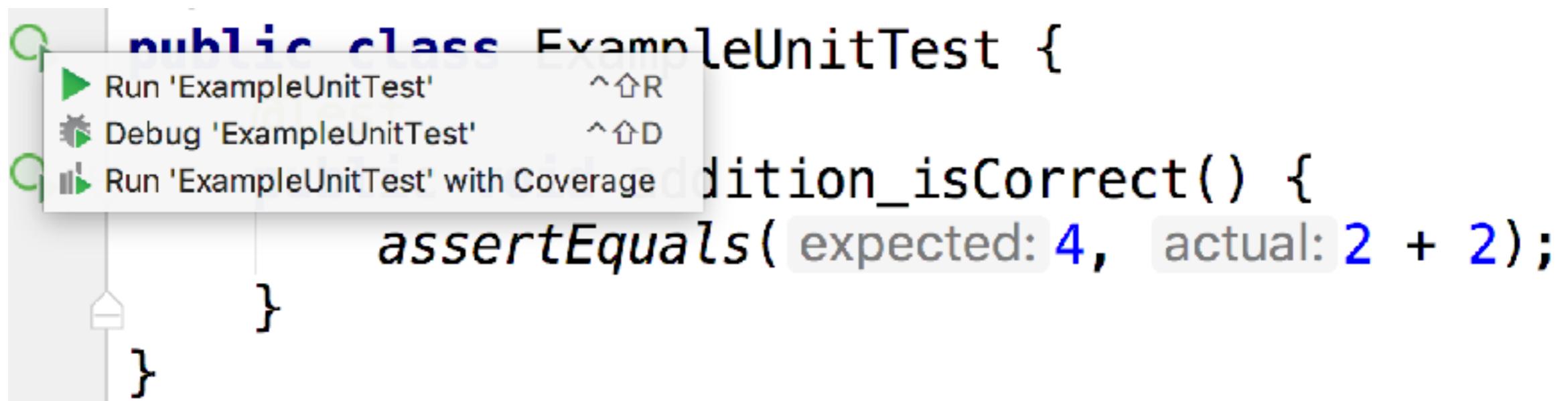
Check code coverage

Right click at test or androidTest directory



Check code coverage

Right click at test or androidTest directory



Check code coverage

See the result

Coverage testing in app (1)				
	Element	Class, %	Method, %	Line, %
↑	data	0% (0/2)	0% (0/4)	0% (0/37)
↓	ui	0% (0/5)	0% (0/9)	0% (0/42)
↳	BuildConfig	0% (0/1)	0% (0/1)	0% (0/1)
↳	R	0% (0/14)	0% (0/1)	0% (0/42)



Check code coverage

Export the result to HTML format

[all classes]	[workshop.testing]	
Coverage Summary for Package: workshop.testing		
Package	Class, %	Method, %
workshop.testing	0% (0/ 15)	0% (0/ 17)
Class ▲	Class, %	Method, %
BuildConfig	0% (0/ 1)	0% (0/ 2)
R	0% (0/ 14)	0% (0/ 15)

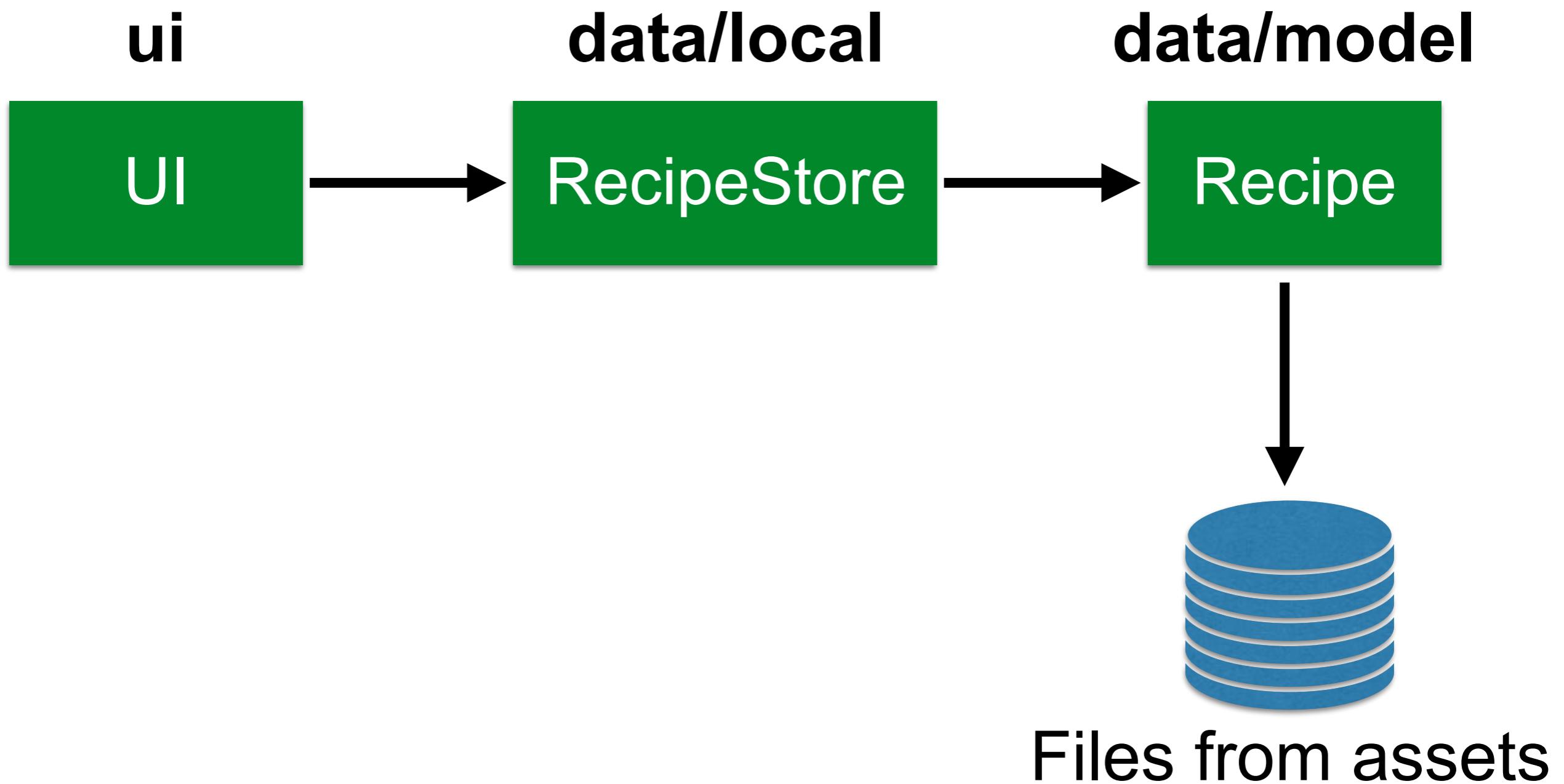
0% is good point to improve !!



Let's coding with tests



What and Where to test ?



Steps to develop app with tests

Read data of recipe from file system

Show detail of recipe in Activity

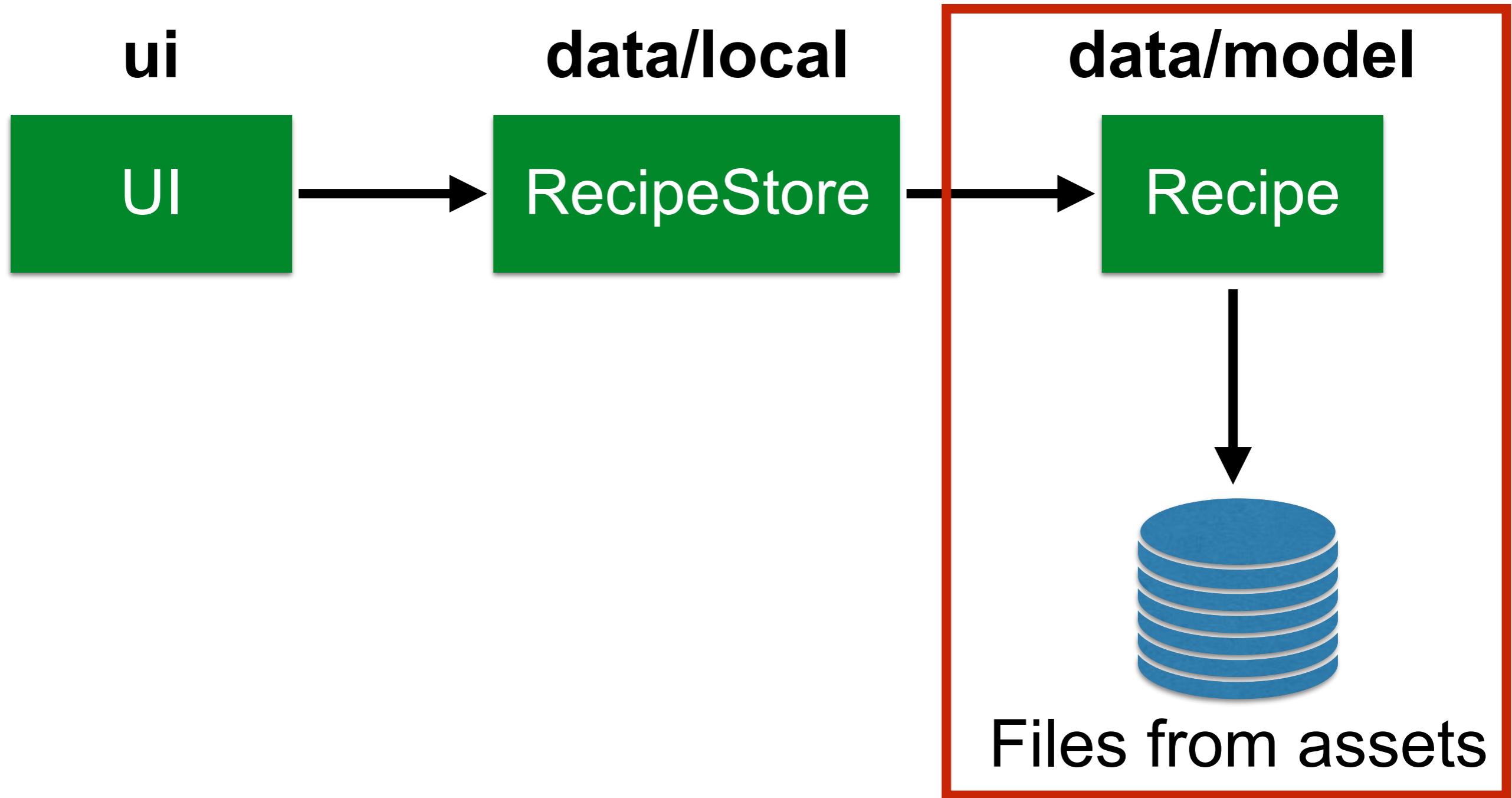
more ...



1. Read data of recipe from file system



Read data from file



Read data from file

What type of Android testing ?



Android Testing

JVM

Device

Non-UI

JVM unit test

Instrumentation unit
test

UI

Robolectric and MVP

Instrumentation UI test

/src/test

/src/androidTest



Read data from file

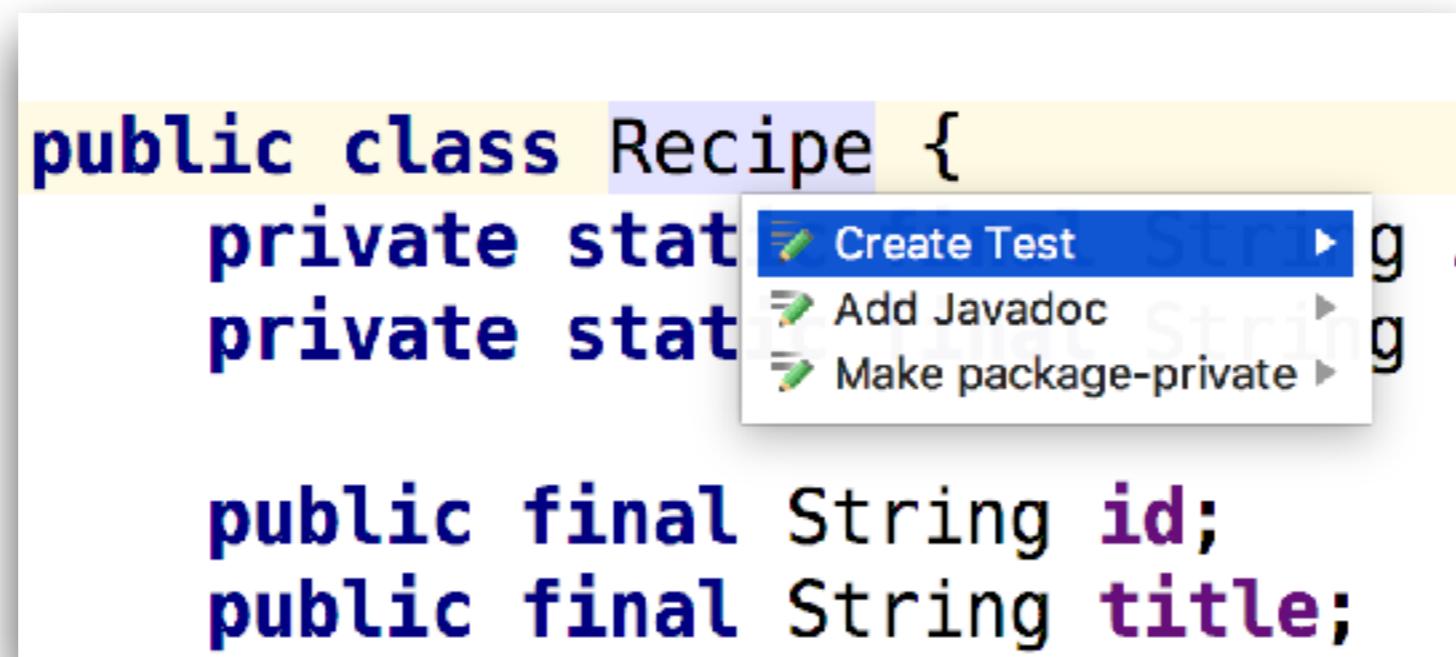
Q: What type of Android testing ?

A: JVM Unit test



Read data from file

Create the new test class with Recipe
(ALT + Enter)



```
public class Recipe {  
    private stat  
    private stat  
    public final String id;  
    public final String title;
```

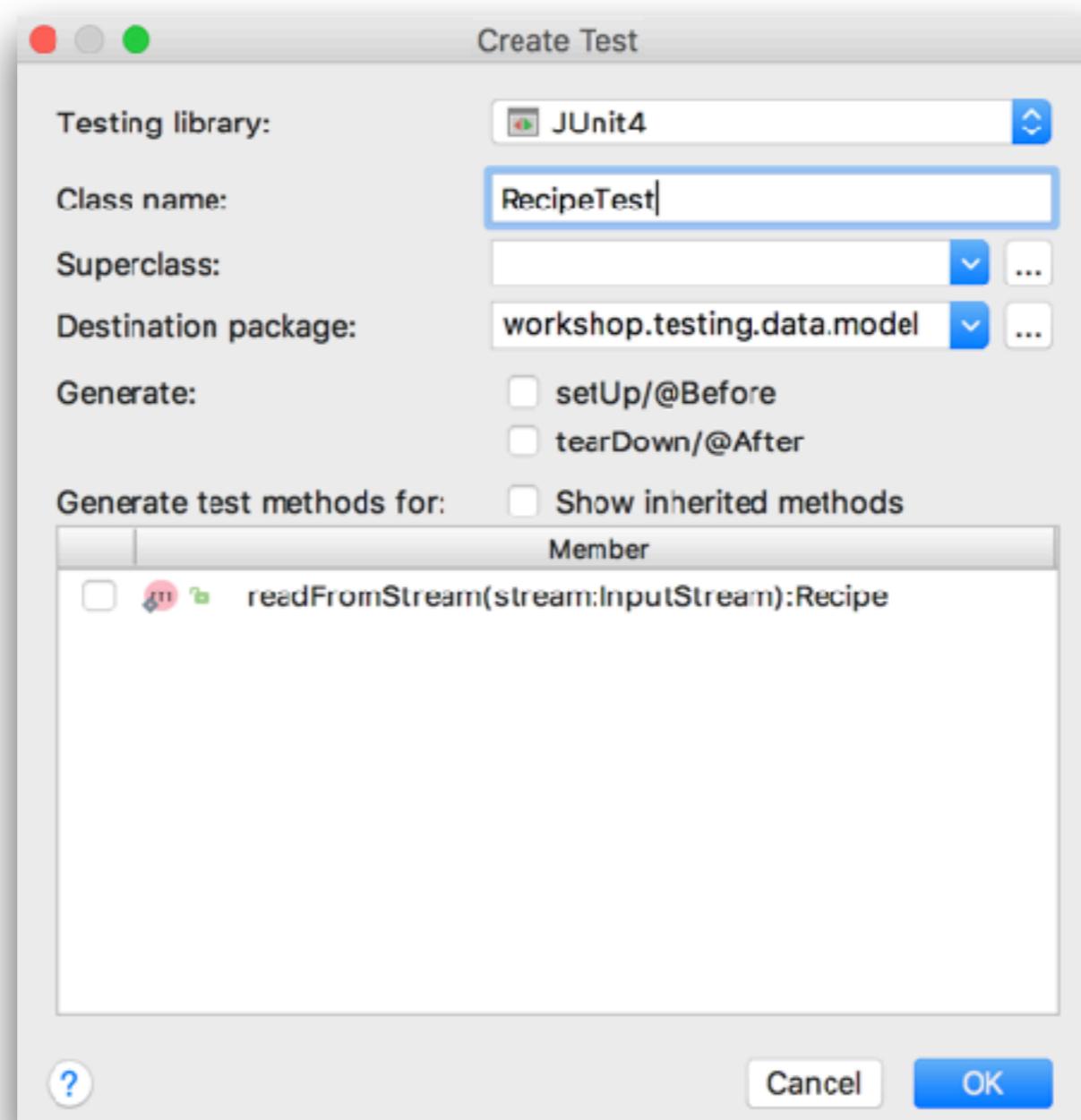
A screenshot of an IDE showing a context menu for the 'Recipe' class. The 'Create Test' option is highlighted. The code block contains the following Java code:

```
public class Recipe {  
    private stat  
    private stat  
    public final String id;  
    public final String title;
```



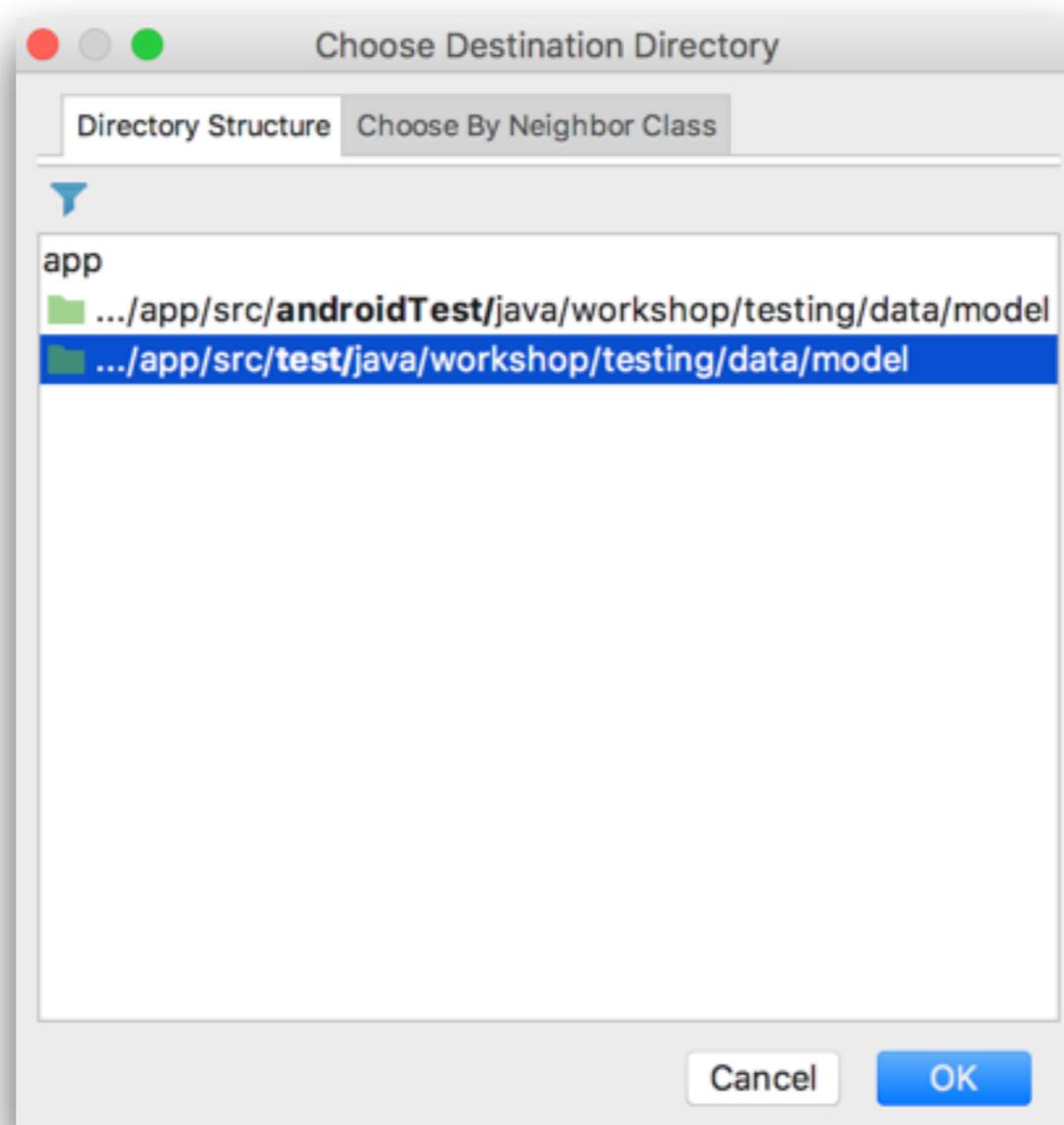
Read data from file

Choose JUnit 4



Read data from file

Choose the destination to test directory



Read data from file

First test case :: read data from water.txt

```
@Test  
public void water() {  
    InputStream stream  
        = RecipeTest.class.getResourceAsStream( name: "/recipes/water.txt");  
  
    Recipe recipe = Recipe.readFromStream(stream);  
  
    assertNotNull(recipe);  
    assertEquals( expected: "water", recipe.id);  
    assertEquals( expected: "Water", recipe.title);  
    assertEquals( expected: "Put glass under tap. Open tap. Close tap. Drink."  
        , recipe.description);  
}
```



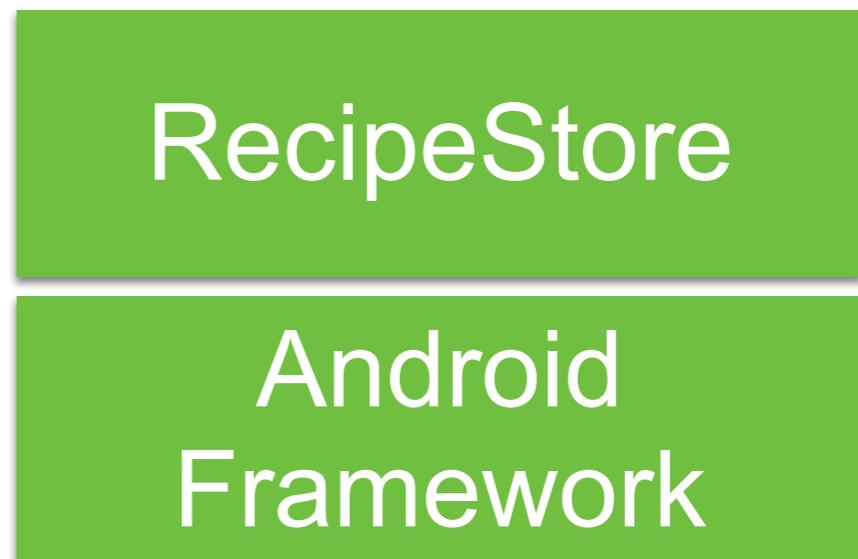
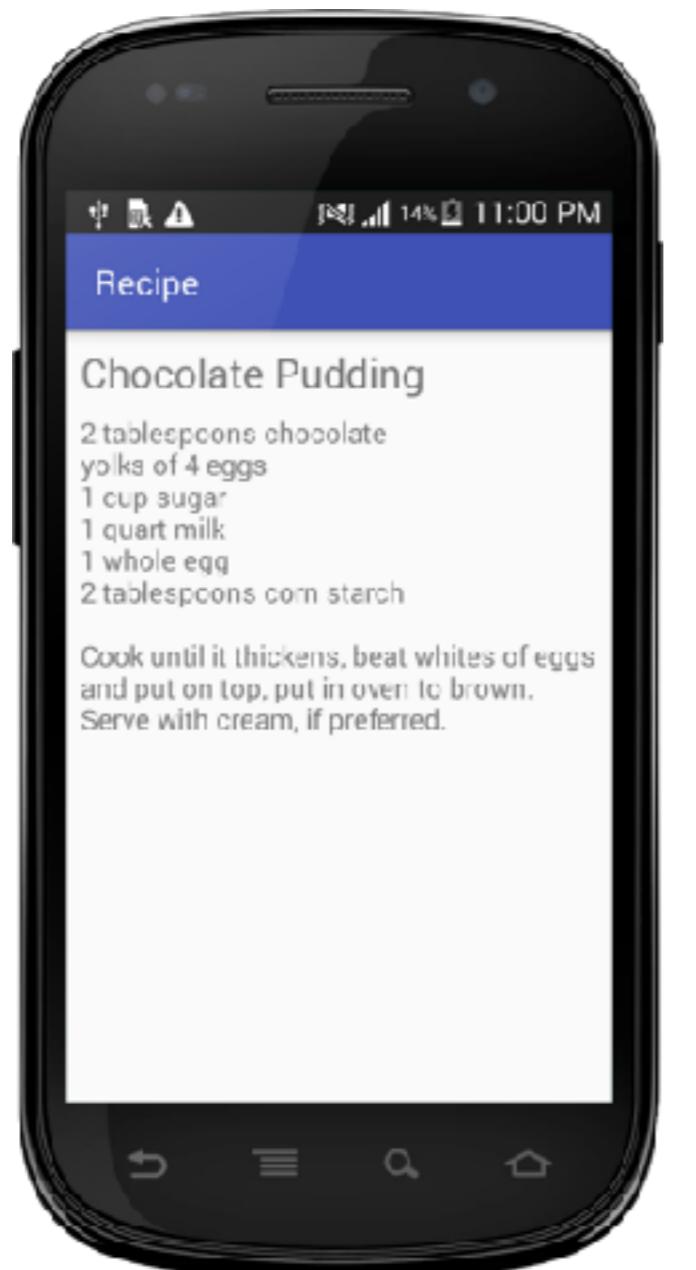
Check code coverage



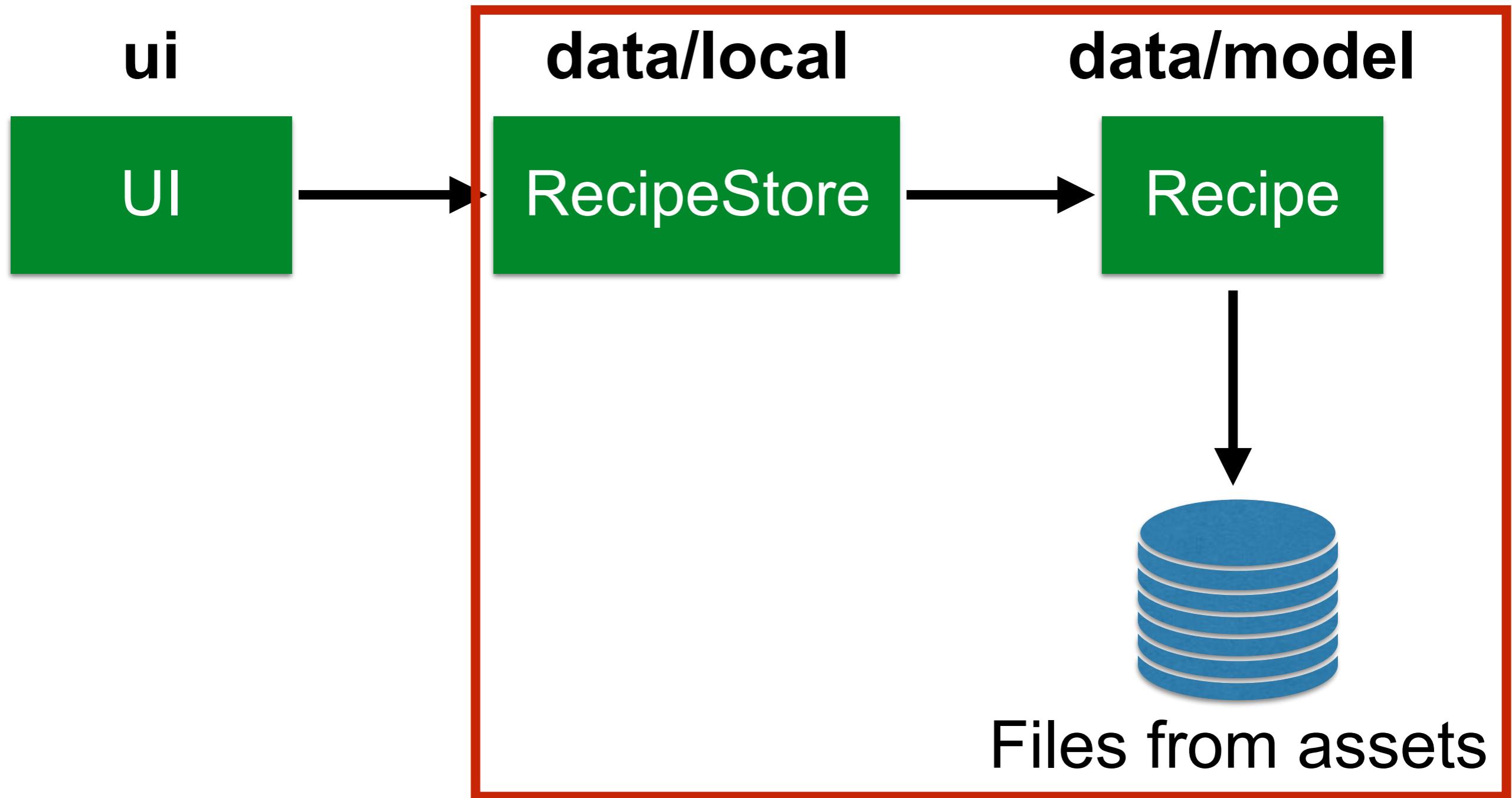
2. Show detail of recipe in Activity



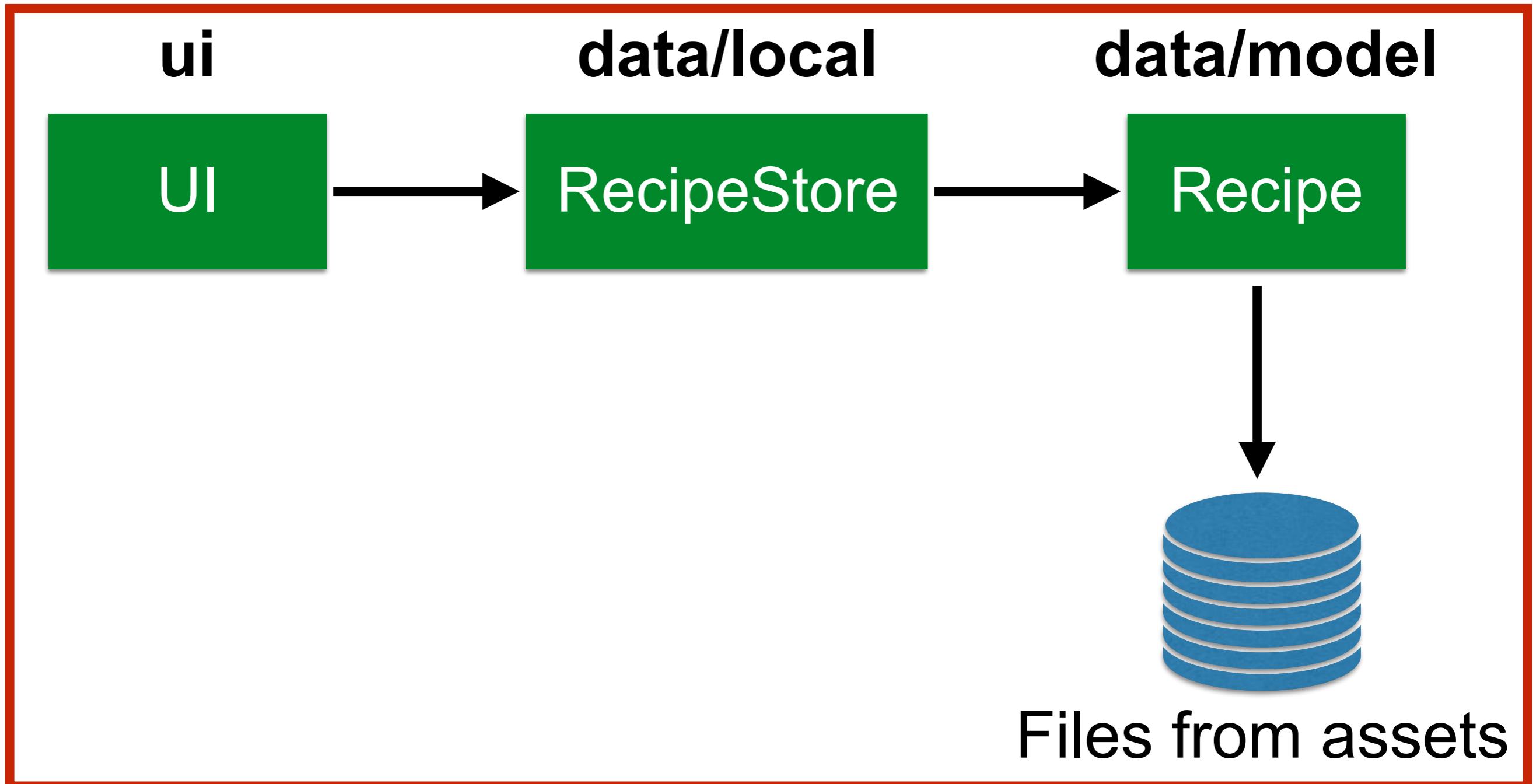
Show detail of recipe



Show detail of recipe (1)



Show detail of recipe (2)

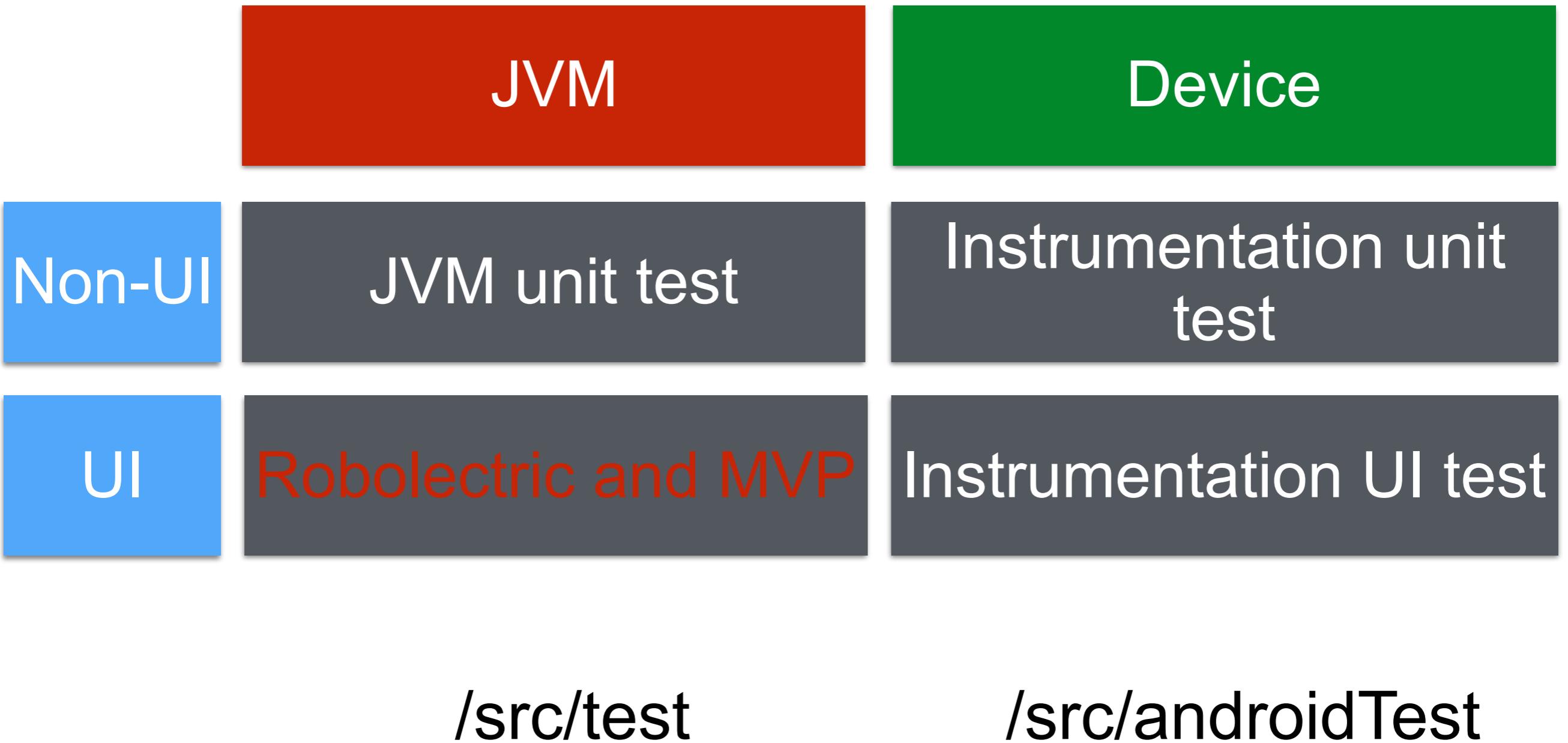


Show detail of recipe

What type of Android testing ?



Android Testing



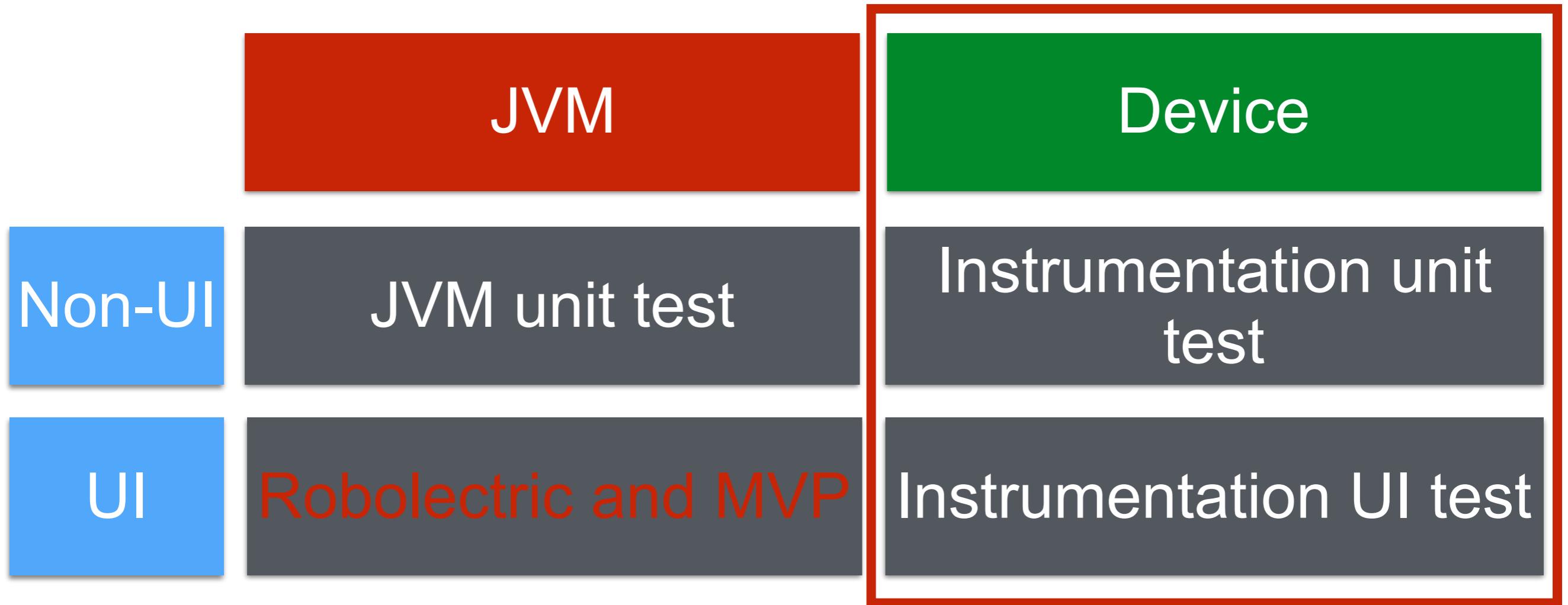
Show detail of recipe

Q: What type of Android testing ?

A: Separated tests in 2 types



Android Testing



/src/test

/src/androidTest



1. Instrumentation Unit test

Q: What to test ?

**A: Check and verify behavior of
RecipeStore**



1. Instrumentation Unit test

Q: What to test ?

Number of recipe(s)
Get detail of recipe



1. Instrumentation Unit test

Test case :: number of recipe(s)

```
@Test  
public void number_of_recipe() {  
    Context context = InstrumentationRegistry.getTargetContext();  
    RecipeStore store = new RecipeStore(context, directory: "recipes");  
    assertNotNull(store);  
    assertNotNull(store.recipes);  
    assertEquals(expected: 1, store.recipes.size());  
}
```



Check code coverage



2. Instrumentation UI test

Q: What to test ?

A: Choose a recipe and show detail in Activity



2. Instrumentation UI test

Test case :: show detail of recipe in Activity

```
@Rule
public ActivityTestRule<RecipeActivity> activityRule
    = new ActivityTestRule<>(
        RecipeActivity.class, initialTouchMode: true, launchActivity: false);

@Test
public void show_detail_of_chocolate_pudding() {
    Intent intent = new Intent();
    intent.putExtra(RecipeActivity.KEY_ID, value: "chocolate_pudding");
    activityRule.launchActivity(intent);

    onView(withId(R.id.title))
        .check(matches(withText("Chocolate Pudding")));
    onView(withId(R.id.description))
        .check(matches(withText("2 tablespoons chocolate\n" +
            "yolks of 4 eggs\n" +
            "1 cup sugar\n" +
            "1 quart milk\n" +
            "1 whole egg\n" +
            "2 tablespoons corn starch\n" +
            "\n" +
            "Cook until it thickens, beat whites of eggs and pu
    }
}
```



Step 1 :: Start activity

```
@Rule
public ActivityTestRule<RecipeActivity> activityRule
    = new ActivityTestRule<>(
        RecipeActivity.class, initialTouchMode: true, launchActivity: false);

@Test
public void show_detail_of_chocolate_pudding() {
    Intent intent = new Intent();
    intent.putExtra(RecipeActivity.KEY_ID, value: "chocolate_pudding");
    activityRule.launchActivity(intent);

    onView(withId(R.id.title))
        .check(matches(withText("Chocolate Pudding")));
    onView(withId(R.id.description))
        .check(matches(withText("2 tablespoons chocolate\n" +
            "yolks of 4 eggs\n" +
            "1 cup sugar\n" +
            "1 quart milk\n" +
            "1 whole egg\n" +
            "2 tablespoons corn starch\n" +
            "\n" +
            "Cook until it thickens, beat whites of eggs and pu
    })
}
```



Step 2 :: Create new test case

```
@Rule
public ActivityTestRule<RecipeActivity> activityRule
    = new ActivityTestRule<>(
        RecipeActivity.class, initialTouchMode: true, launchActivity: false);

@Test
public void show_detail_of_chocolate_pudding() {
    Intent intent = new Intent();
    intent.putExtra(RecipeActivity.KEY_ID, value: "chocolate_pudding");
    activityRule.launchActivity(intent);

    onView(withId(R.id.title))
        .check(matches(withText("Chocolate Pudding")));
    onView(withId(R.id.description))
        .check(matches(withText("2 tablespoons chocolate\n" +
            "yolks of 4 eggs\n" +
            "1 cup sugar\n" +
            "1 quart milk\n" +
            "1 whole egg\n" +
            "2 tablespoons corn starch\n" +
            "\n" +
            "Cook until it thickens, beat whites of eggs and pu
    })
}
```



Step 3 :: Pass data with intent

```
@Rule
public ActivityTestRule<RecipeActivity> activityRule
    = new ActivityTestRule<>(
        RecipeActivity.class, initialTouchMode: true, launchActivity: false);

@Test
public void show_detail_of_chocolate_pudding() {
    Intent intent = new Intent();
    intent.putExtra(RecipeActivity.KEY_ID, value: "chocolate_pudding");
    activityRule.launchActivity(intent);

    onView(withId(R.id.title))
        .check(matches(withText("Chocolate Pudding")));
    onView(withId(R.id.description))
        .check(matches(withText("2 tablespoons chocolate\n" +
            "yolks of 4 eggs\n" +
            "1 cup sugar\n" +
            "1 quart milk\n" +
            "1 whole egg\n" +
            "2 tablespoons corn starch\n" +
            "\n" +
            "Cook until it thickens, beat whites of eggs and pu
    })
}
```



Step 4 :: Verify data in activity

```
@Rule
public ActivityTestRule<RecipeActivity> activityRule
    = new ActivityTestRule<>(
        RecipeActivity.class, initialTouchMode: true, launchActivity: false);

@Test
public void show_detail_of_chocolate_pudding() {
    Intent intent = new Intent();
    intent.putExtra(RecipeActivity.KEY_ID, value: "chocolate_pudding");
    activityRule.launchActivity(intent);

    onView(withId(R.id.title))
        .check(matches(withText("Chocolate Pudding")));
    onView(withId(R.id.description))
        .check(matches(withText("2 tablespoons chocolate\n" +
            "yolks of 4 eggs\n" +
            "1 cup sugar\n" +
            "1 quart milk\n" +
            "1 whole egg\n" +
            "2 tablespoons corn starch\n" +
            "\n" +
            "Cook until it thickens, beat whites of eggs and pu
    })
}
```



Check code coverage



Assignments/Homework



Assignments/Homework

List of recipes from assets

Add more tests/more code coverage

Add more features such as Favorite

Push all changes to your Github repository



Summary of this course



Resources

<https://developer.android.com/studio/test/index.html>

<https://developer.android.com/topic/libraries/testing-support-library/index.html#Espresso>



Test-Driven Development

