Testing Android apps using Espresso in Java or Kotlin

Overview

In this tutorial, we will "create" some UI tests for an Android application using Espresso testing library.

Tests can be written either in Java or Kotlin.

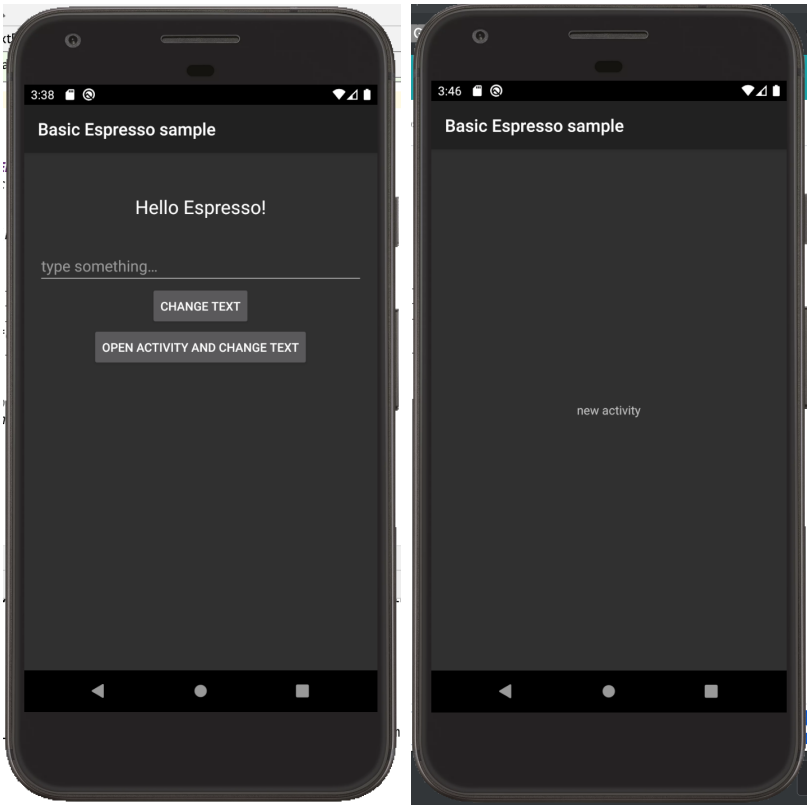
Requirements

- gradle 5.6
- Android SDK (e.g. v28)
- JDK
- (optional) Android Studio

Description

For this tutorial, we'll use a basic Espresso example project provided by Google, with minor updates as tracked in this fork.

The Android application is quite simple: it contains two activities, where the main one as an input to change some text along with two buttons that will give the possibility to change the text in the current activity of in a new one.



The code related to the previous activities can be found here.

The project contains 2 tests, implemented both in Java and in Kotlin (thus, overall 4 tests although 2 "duplicated").

Tests use the Espresso testing library for UI-based tests. Espresso comes as part of Android SDK; a brief overview can be found here.

Espresso provides ways of interacting with the UI and assertions that can be used to perform checks in your tests.

app/src/androidTest/java/com/example/android/testing/espresso/BasicSample/ChangeTextBehaviorTest.java

```
/*
 * Copyright 2018, The Android Open Source Project
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 *      http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

package com.example.android.testing.espresso.BasicSample

import androidx.test.ext.junit.rules.activityScenarioRule
import android.app.Activity
import androidx.test.core.app.ActivityScenario
import androidx.test.core.app.launchActivity
import androidx.test.espresso.Espresso.onView
import androidx.test.espresso.action.ViewActions
import androidx.test.espresso.action.ViewActions.*
import androidx.test.espresso.assertion.ViewAssertions.matches
import androidx.test.espresso.matcher.ViewMatchers
import androidx.test.espresso.matcher.ViewMatchers.withId
import androidx.test.espresso.matcher.ViewMatchers.withText
import androidx.test.ext.junit.runners.AndroidJUnit4
import androidx.test.filters.LargeTest
import org.junit.Before
import org.junit.Rule
import org.junit.Test
import org.junit.runner.RunWith


/**
 * The kotlin equivalent to the ChangeTextBehaviorTest, that
 * showcases simple view matchers and actions like [ViewMatchers.withId],
 * [ViewActions.click] and [ViewActions.typeText], and ActivityScenarioRule
 *
 *
 * Note that there is no need to tell Espresso that a view is in a different [Activity].
 */
@RunWith(AndroidJUnit4::class)
@LargeTest
class ChangeTextBehaviorKtTest {

    /**
     * Use [ActivityScenarioRule] to create and launch the activity under test before each test,
     * and close it after each test. This is a replacement for
     * [androidx.test.rule.ActivityTestRule].
     */
    @get:Rule var activityScenarioRule = activityScenarioRule<MainActivity>()

    @Test
    fun changeText_sameActivity() {

        // Type text and then press the button.
        onView(withId(R.id.editTextUserInput))
                .perform(typeText(STRING_TO_BE_TYPED), closeSoftKeyboard())
        onView(withId(R.id.changeTextBt)).perform(click())

        // Check that the text was changed.
        onView(withId(R.id.textToBeChanged)).check(matches(withText(STRING_TO_BE_TYPED)))
    }

    @Test
    fun changeText_newActivity() {
        // Type text and then press the button.
```

```
        onView(withId(R.id.editTextUserInput)).perform(typeText(STRING_TO_BE_TYPED),
                closeSoftKeyboard())
        onView(withId(R.id.activityChangeTextBtn)).perform(click())

        // This view is in a different Activity, no need to tell Espresso.
        onView(withId(R.id.show_text_view)).check(matches(withText(STRING_TO_BE_TYPED)))
    }

    companion object {

        val STRING_TO_BE_TYPED = "Espresso"
    }
}
```

app/src/androidTest/java/com/example/android/testing/espresso/BasicSample/ChangeTextBehaviorKtTest.java

```
/*
 * Copyright 2018, The Android Open Source Project
 *
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *
 *      http://www.apache.org/licenses/LICENSE-2.0
 *
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

package com.example.android.testing.espresso.BasicSample

import androidx.test.ext.junit.rules.activityScenarioRule
import android.app.Activity
import androidx.test.core.app.ActivityScenario
import androidx.test.core.app.launchActivity
import androidx.test.espresso.Espresso.onView
import androidx.test.espresso.action.ViewActions
import androidx.test.espresso.action.ViewActions.*
import androidx.test.espresso.assertion.ViewAssertions.matches
import androidx.test.espresso.matcher.ViewMatchers
import androidx.test.espresso.matcher.ViewMatchers.withId
import androidx.test.espresso.matcher.ViewMatchers.withText
import androidx.test.ext.junit.runners.AndroidJUnit4
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 * showcases simple view matchers and actions like [ViewMatchers.withId],
 * [ViewActions.click] and [ViewActions.typeText], and ActivityScenarioRule
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 *
 * Note that there is no need to tell Espresso that a view is in a different [Activity].
 */
@RunWith(AndroidJUnit4::class)
@LargeTest
class ChangeTextBehaviorKtTest {

    /**
     * Use [ActivityScenarioRule] to create and launch the activity under test before each test,
     * and close it after each test. This is a replacement for
     * [androidx.test.rule.ActivityTestRule].
```

```
     */
    @get:Rule var activityScenarioRule = activityScenarioRule<MainActivity>()

    @Test
    fun changeText_sameActivity() {

        // Type text and then press the button.
        onView(withId(R.id.editTextUserInput))
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        onView(withId(R.id.changeTextBt)).perform(click())

        // Check that the text was changed.
        onView(withId(R.id.textToBeChanged)).check(matches(withText(STRING_TO_BE_TYPED)))
    }

    @Test
    fun changeText_newActivity() {
        // Type text and then press the button.
        onView(withId(R.id.editTextUserInput)).perform(typeText(STRING_TO_BE_TYPED),
                closeSoftKeyboard())
        onView(withId(R.id.activityChangeTextBtn)).perform(click())

        // This view is in a different Activity, no need to tell Espresso.
        onView(withId(R.id.show_text_view)).check(matches(withText(STRING_TO_BE_TYPED)))
    }

    companion object {

        val STRING_TO_BE_TYPED = "Espresso"
    }
}
```

There are different types of tests: local unit tests (i.e. unit tests that don't need a device/emulator) and instrumentation tests (which run on a device /emulator).

Depending on which tests, checks and tasks you want to run, the `gradle` syntax needs to be adapted accordingly; you may use "`gradle tasks`" (or "`gradlew tasks`") to find out all available tasks.

Thus, you'll find multiple ways of running the tests using the command line.

For local unit tests, you may use:

- `./gradlew check`
- `./gradlew test`
- `gradle clean cleanTest test`

In this case, test results will be stored as multiple JUnit XML files in build/test-results.

For instrumentation tests, you may use:

- `./gradlew connectedAndroidTest`
- `./gradlew app:connectedCheck`

In this case, test results will be stored as one JUnit XML file in a directory similar to `build/outputs/<xxxx>-results/connected.`

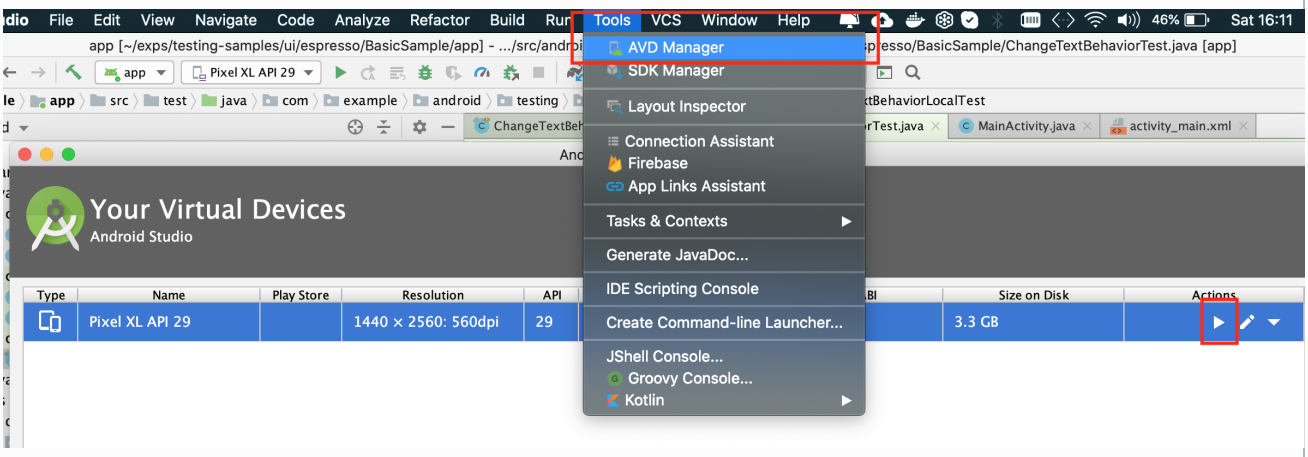
> If you're using Android Studio, then you can also use it to write and run your tests.
>
> However, if you decide to manually export the results to an XML file, that format is not a JUnit XML compatible one in is thus not supported.

To run the tests during CI, we can invoke `gradle/gradlew`.

```
# run the tests in the installed app
./gradlew app:connectedCheck
# ...or... install app and run the tests
#./gradlew connectedAndroidTest
```

Please note

You may start an emulator from within Android Studio (Tools => AVD Manager).



You may also use the command line, for example:

```
emulator -avd Pixel_XL_API_29
```

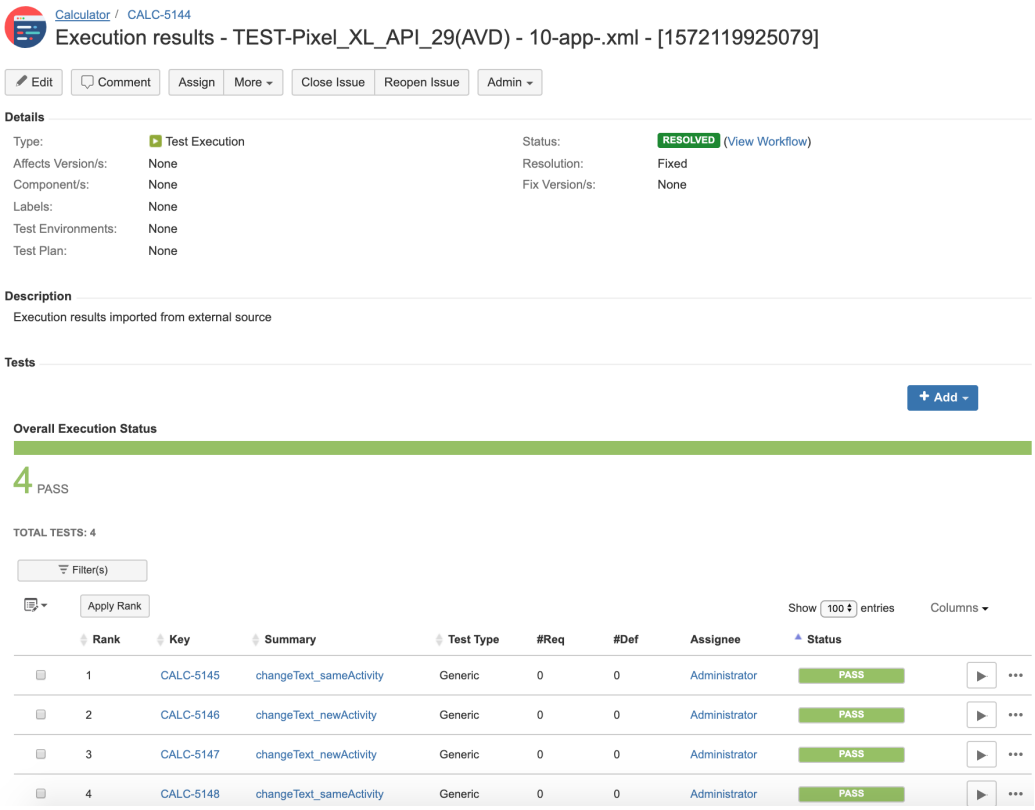
If you need to find out the name of the AVD, you may use:

```
emulator -list-avds
```

After running the tests and generating the JUnit XML report(s) (e.g., TEST-Pixel_XL_API_29(AVD) - 10-app-.xml), it can be imported to Xray (either by the REST API or by using one of the CI plugins or through **Import Execution Results** action within the Test Execution).

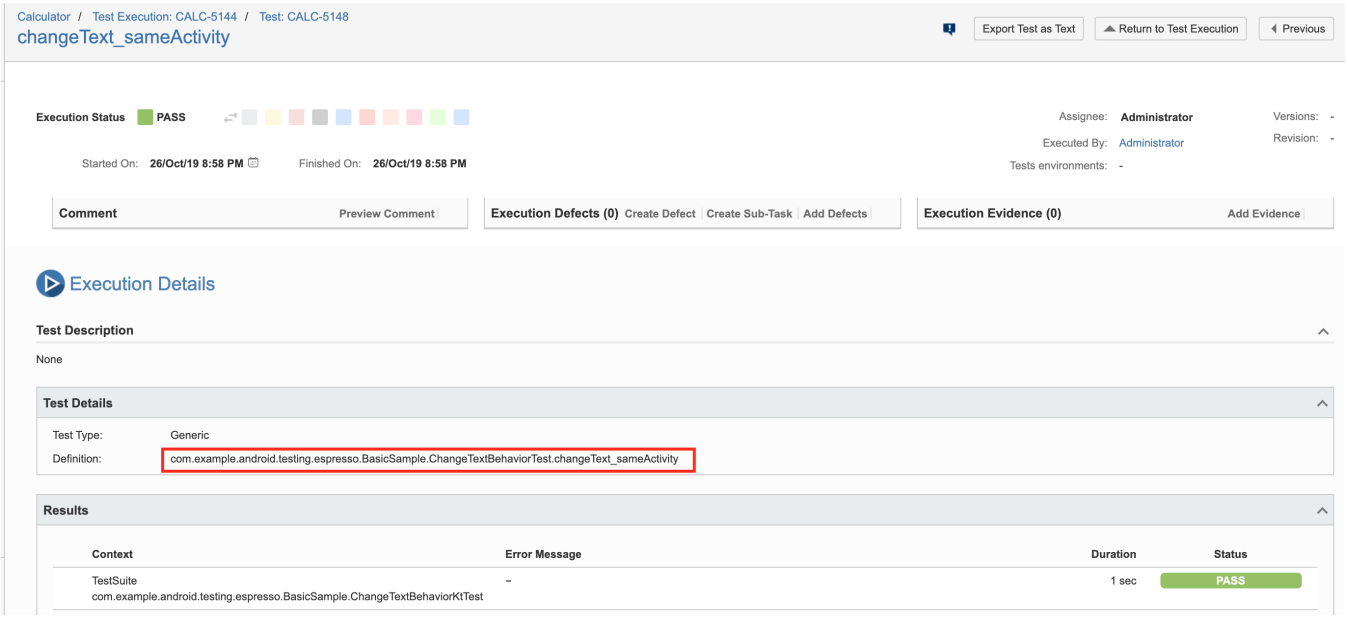
```
curl -H "Content-Type: multipart/form-data" -u admin:admin -F "file=@app/build/outputs/androidTest-results
/connected/TEST-Pixel_XL_API_29\(AVD\)\ -\ 10-app-.xml" http://jiraserver.example.com/rest/raven/1.0/import
/execution/junit?projectKey=CALC
```

A Test Execution will be created containing information about the executed scenarios.



Each test is mapped to a Generic Test in Jira, and the **Generic Test Definition** field contains the name of the class concatenated with the method name of the corresponding automated test.

The Execution Details of the Generic Test contains information about the "Test Suite" (as per JUnit format), which in this case corresponds to the first test full classpath.



Notes

You can also import local unit tests. Note that you'll have a JUnit XML file per test class. You may use junit-merge utility in case you want to merge all these reports to a single JUnit XML report.

References

- https://developer.android.com/training/testing/espresso
- https://developer.android.com/training/testing/espresso/additional-resources
- https://developer.android.com/training/testing
- https://developer.android.com/training/testing/ui-testing/index.html
- https://developer.android.com/studio/test
- https://developer.android.com/kotlin