Test Android Calculator APK- Black Box Testing

To test an Android apk file using Robotium requires to

- Install apk file on device we will use AndroidCalculator apk file, click Here to find Apk
- Create Test Project using eclipse to test that apk

Note: If android working environment is not set on your machine, follow Set up Android Working Environment

1. Install AUT (Application Under Test) APK

Apk file can be installed on device or emulator. Before installing it needs to make sure that apk file is signed in debug mode. If not it can be signed as debug mode in next steps.

If apk file already has debug mode signatures skip next steps and jump to Load Emulator section.

Note: if you are not sure about the current signed mode of apk file, it's better to resign it.

Sign Apk file in debug mode

The apk file must have the same certificate signature that your test project has. The signature will identify the author of the android application. Signature means it contains the information like First Name and Last Name of the developer, Name of the Organizational Unit, Organization, City, State, two-letter Country Code. We will un-sign already signed apk file and then again sign it with debug key. Standard tools like Keytool and Jarsigner are used to generate keys and sign applications. For more help visit:
http://developer.android.com/guide/publishing/app-signing.html

Important Steps:

1.If you know the certificate signature then use the same signature in test project
2. If you do not know the certificate signature then delete the certificate signature and use the same android debug key signature in both the application and the test project
3. If the application is unsigned then sign the application apk with the android debug key

To un-signed a signed application download java program from http://www.troido.de/re-sign.jar double click on it to open it and drop apk file on it
Or
* Un-zip the apk file
* Delete the META-¬INF folder
* Re-zip the apk file
    It will zip file as "applicationName.apk.zip" , rename it and make it as "applicationName.apk"
* In Dos prompt/Terminal write following commands

> jarsigner -keystore ~/.android/debug.keystore -storepass android -keypass android applicationName.apk androiddebugkey
> zipalign 4 applicationName.apk TempApplicationName.apk

Note:

For java 7 please use following command instead,

> jarsigner -keystore ~/.android/debug.keystore -storepass android -keypass android -sigalg MD5withRSA -digestalg SHA1 applicationName.apk androiddebugkey

Then rename TempApplicationName.apk to applicationName.apk if you need.
For more help visit: http://developer.android.com/guide/publishing/app-signing.html

Load Emulator

Load command prompt (windows user) or Terminal (Linux users) and write following command to run emulator

emulator -avd <device name>

here the Device Name is our AVD (Android Virtual Device) created in Set up Android Working Environment, it will load emulator in few seconds.

If it shows some error most probably the Android SDK path in not set in PATH environment variable. One can set up Android SDK path in next step, skip next step if emulator is working

Set Up Android SDK Path

Follow the section suits your OS (Operating System) to set SDK path

Linux (ubuntu)

Load terminal and write

echo $PATH

(it will print value of PATH, if Android SDK path is not visible move on next step to add path). To set path enter following command

sudo gedit /etc/bash.bashrc (it will ask password, enter the password)

It will load bash.bashrc file into gedit (text editor) and at end of file add following lines into file and save it.

Note: it is showing the path for all tools necessary for android, based on my current system directory; you need to replace with your own path where Android SDK resides

export PATH=${PATH}:/home/naveed/android-sdk/
export PATH=${PATH}:/home/naveed/android-sdk/tools/
export PATH=${PATH}:/home/naveed/android-sdk/platform-tools/

now reload the Terminal and run emulator -avd <device name> command again it will load emulator

Windows
Load Command Prompt and write

echo %PATH%

(it will print value of PATH, if Android SDK path is not visible move on next step to set path). To set path enter following commands one by one

set PATH=${PATH}:c:/naveed/android-sdk/
set PATH=${PATH}:c:/naveed/android-sdk/tools
set PATH=${PATH}:c:/naveed/android-sdk/platform-tools/

Note: it is showing the path for all tools necessary for android, based on my current system directory, you need to replace with your own path where Android SDK resides

Now reload the Command Prompt and run

emulator -avd <device name>

now it will load emulator

Install AUT apk on Emulator
After the emulator is working, we can now install AUT (application under Test) apk on emulator. To install apk load another instance of command prompt/terminal (based on your os), and write following command to install AndroidCalculator apk on emulator

adb install <path>/AndroidCalculator.apk

the <path> showing the directory where AndroidCalculator.apk is located, in my case it was

adb install /home/naveed/AndroidCalculator.apk

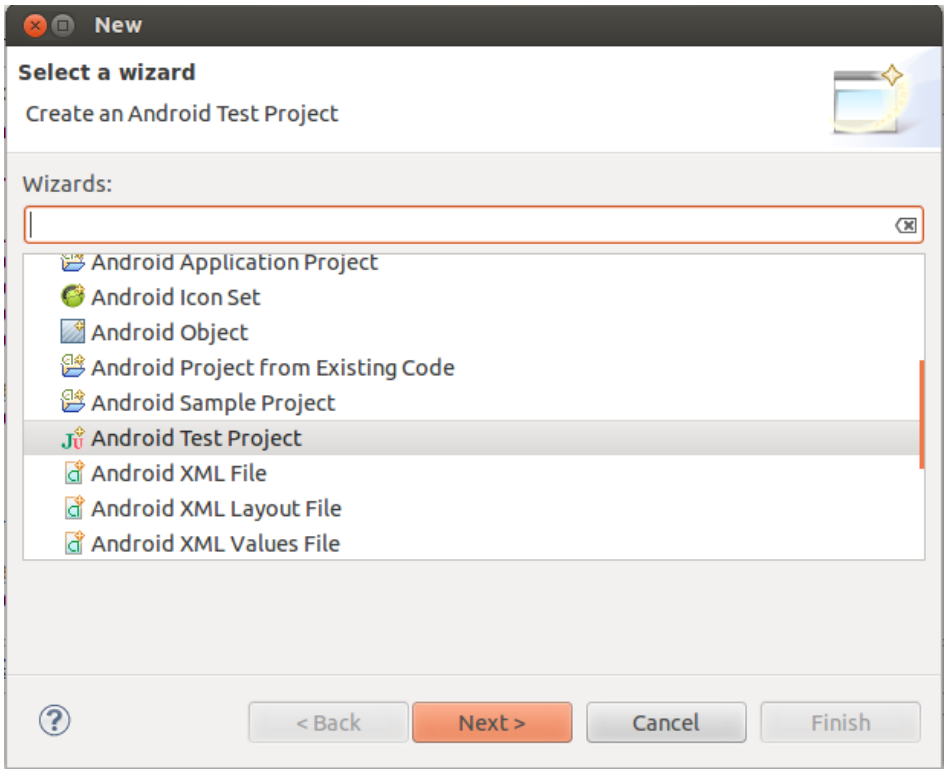
as apk is at my home directory (I am using ubuntu). You need to enter your own path where apk resides. It will successfully install apk file and show success

Note: For sake of understanding Test Project app will be installed on emulator which will then call/load the AUT (already installed) and perform test scenarios on it. When we will run our Test project through Eclipse it will automatically install it on emulator (will do it in coming sections)

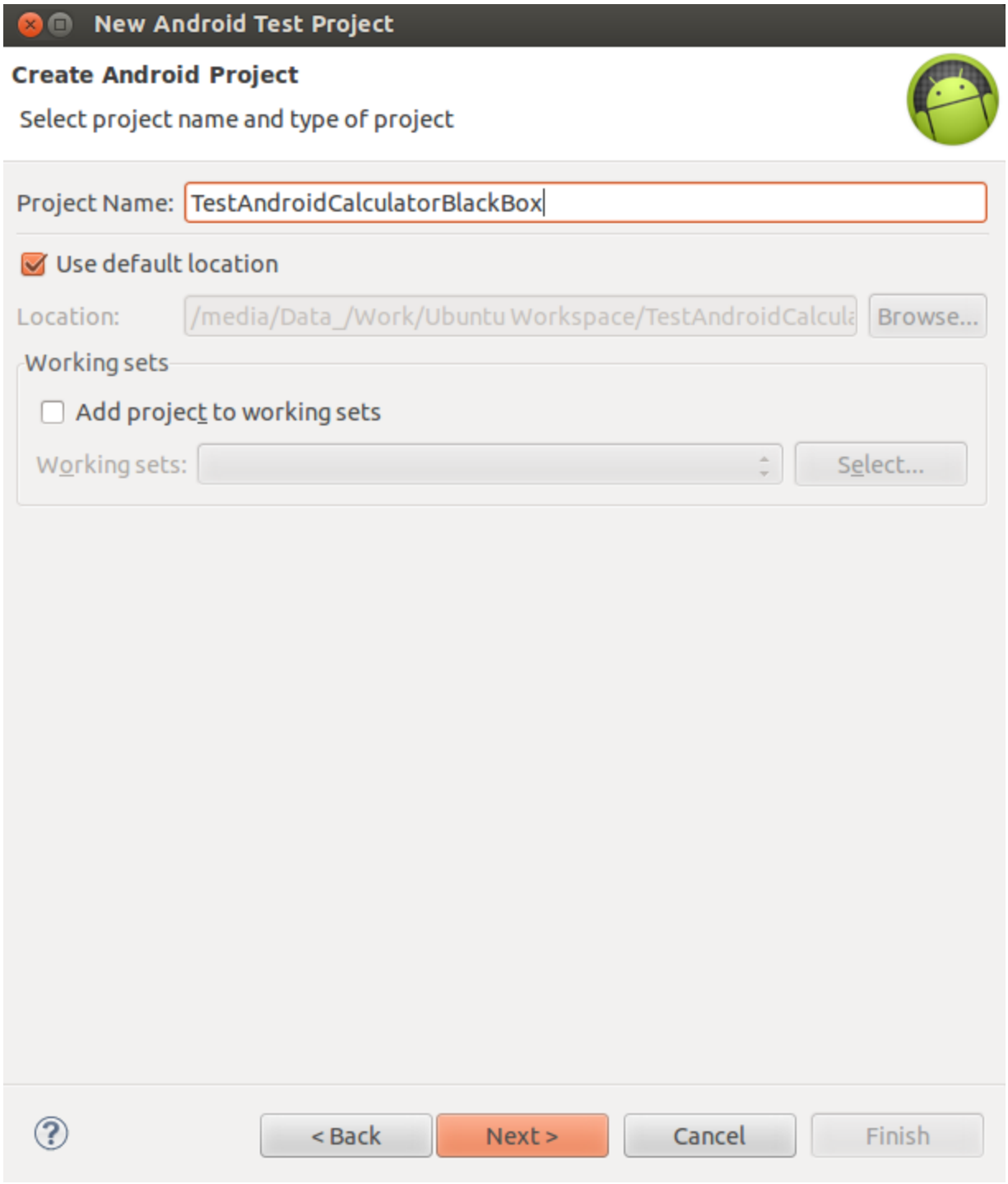
2. Create Test Project

Click on *File* menu, select *New* and click on the *Others*,

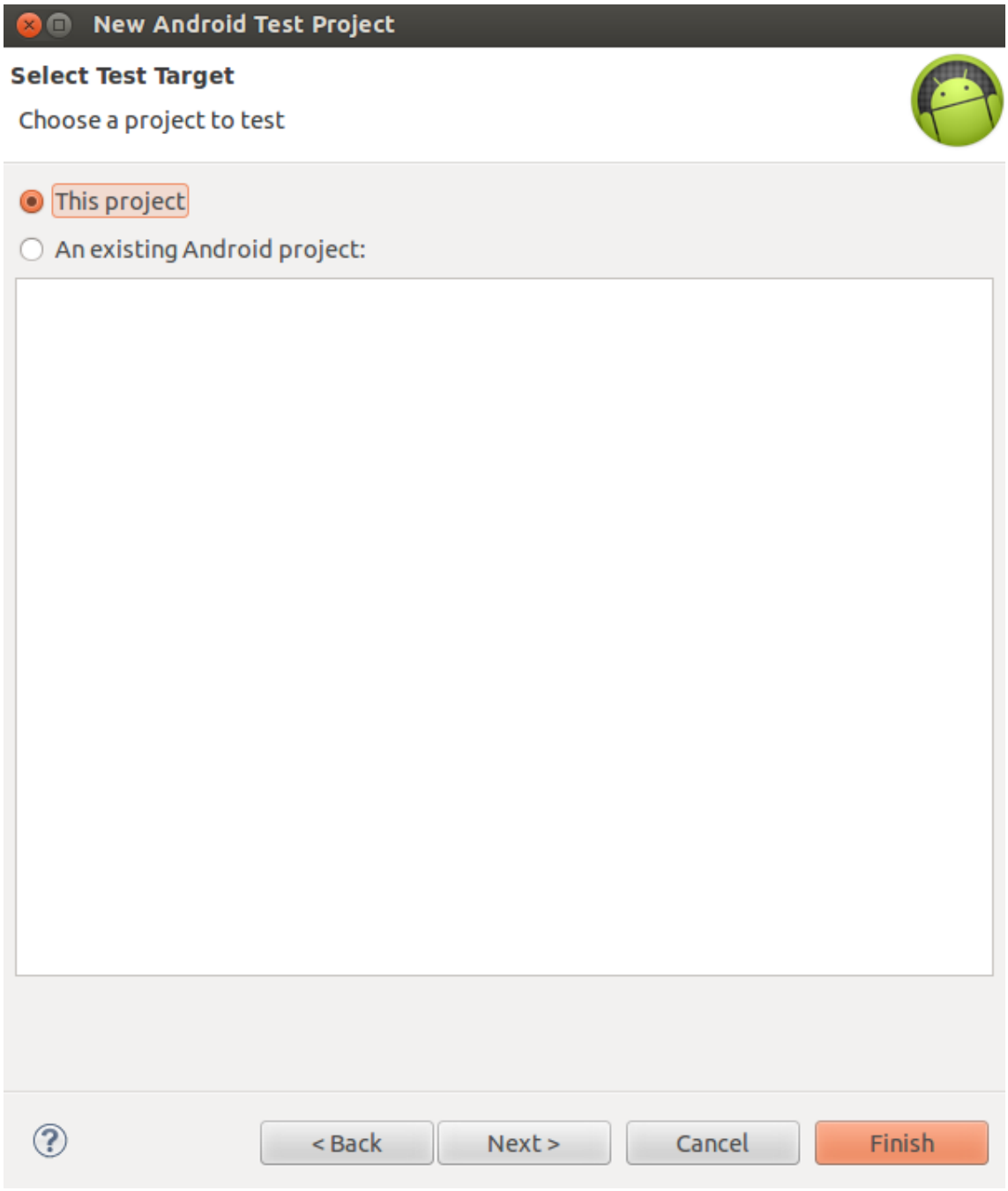
From *New* window, Drag down to *Android* option, expand it, and select *Android Test Project* and Click on *Next*



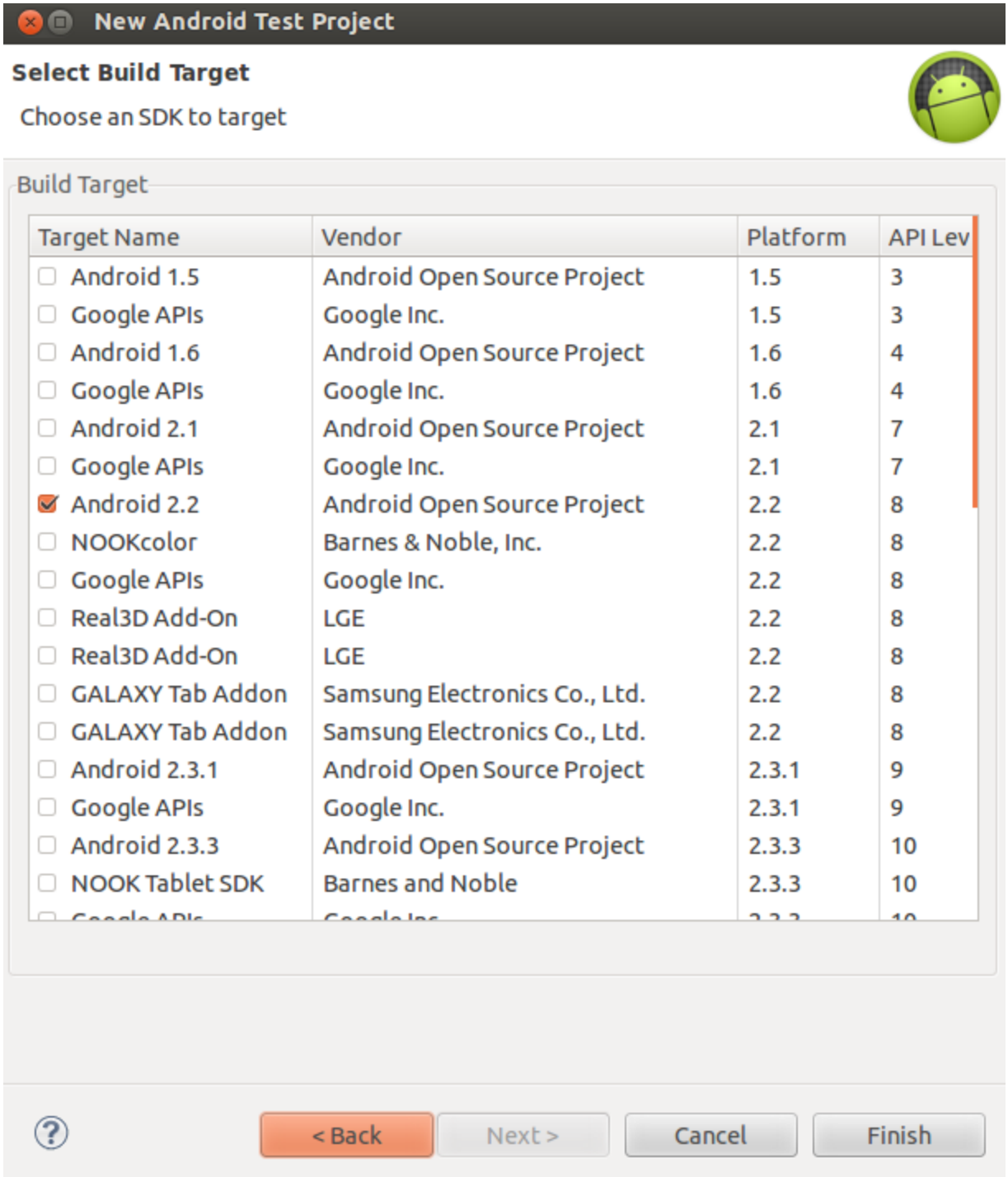
From ‘New Android Project’ Window, enter Test Project Name and click on “Next”



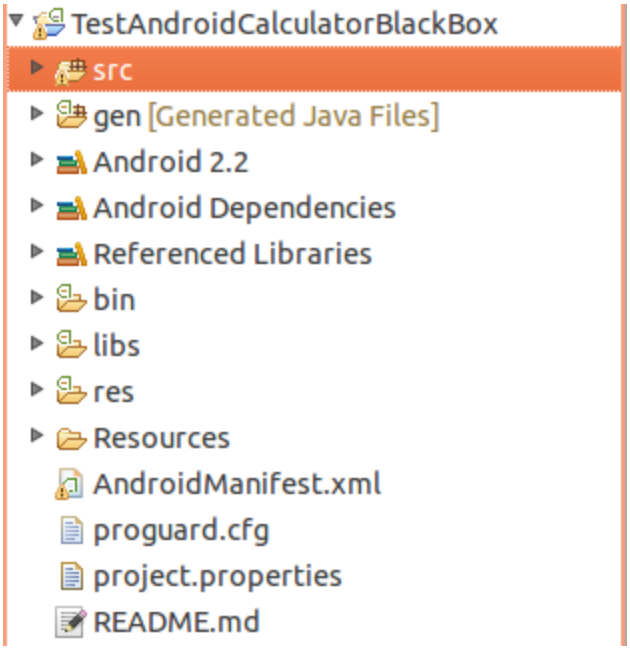
On next window under 'Select TestTarget' section select 'This project' option & click 'Next'



On 'Next' window under 'Select Build Target' section select your desired SDK version, we will select Android 2.2 or one can select any of his choice & press *Finish*.

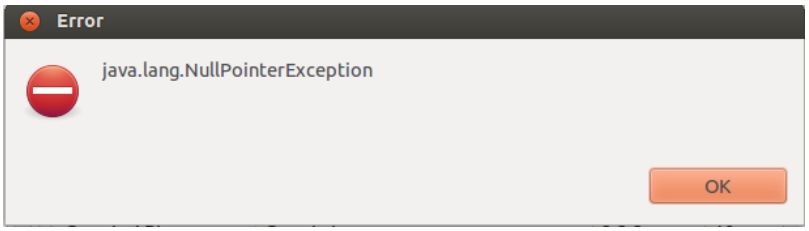


Eclipse will create TestProject with no package,



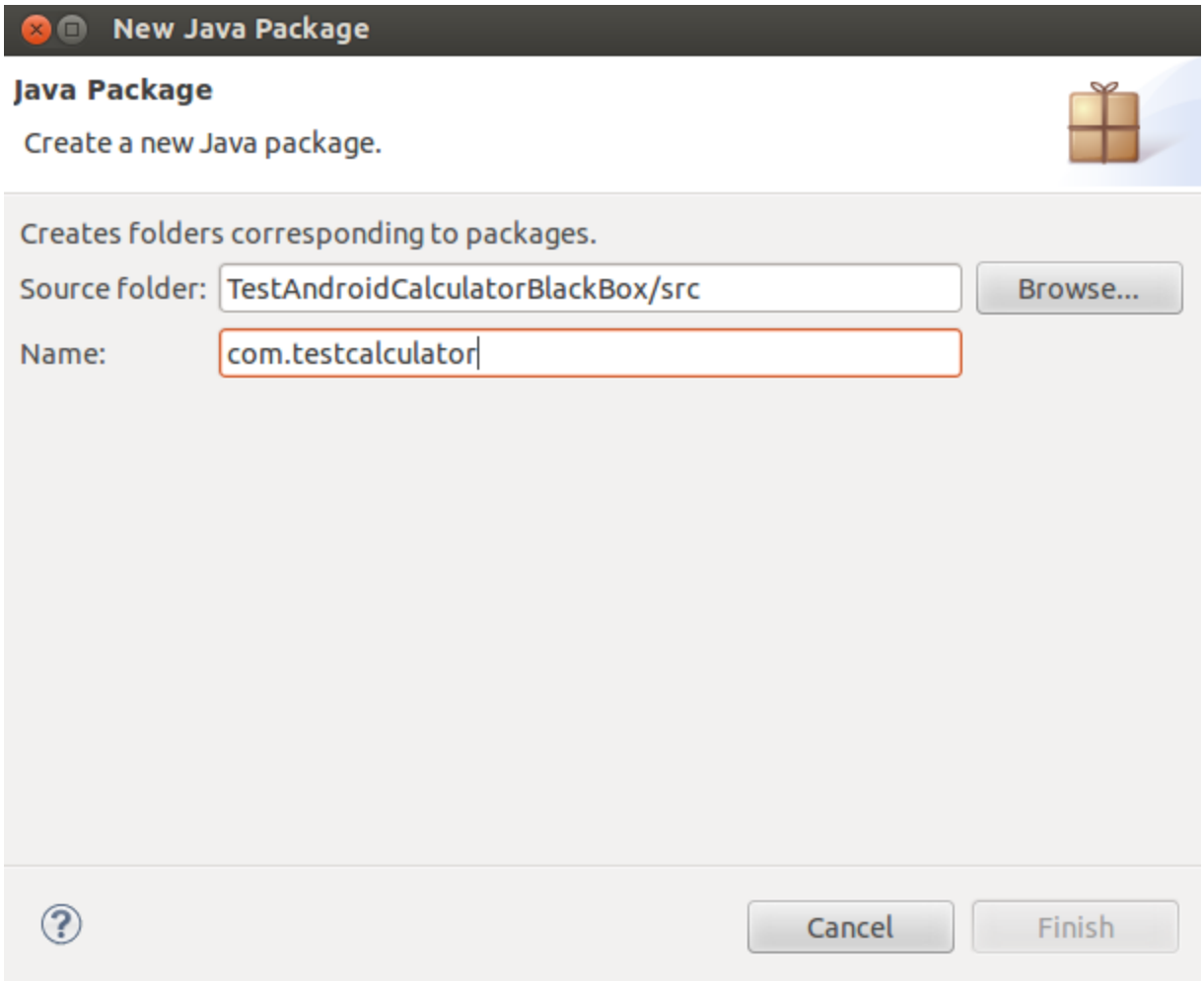
NOTE: A problem especially with novice, when they first time make new workspace and start working with Robotium

If we create new workspace for this tutorial, on creating Test Project eclipse will show error 'java.lang.NullPointerException', because it is new workspace and eclipse is not able to get selected Android resources for first test project.



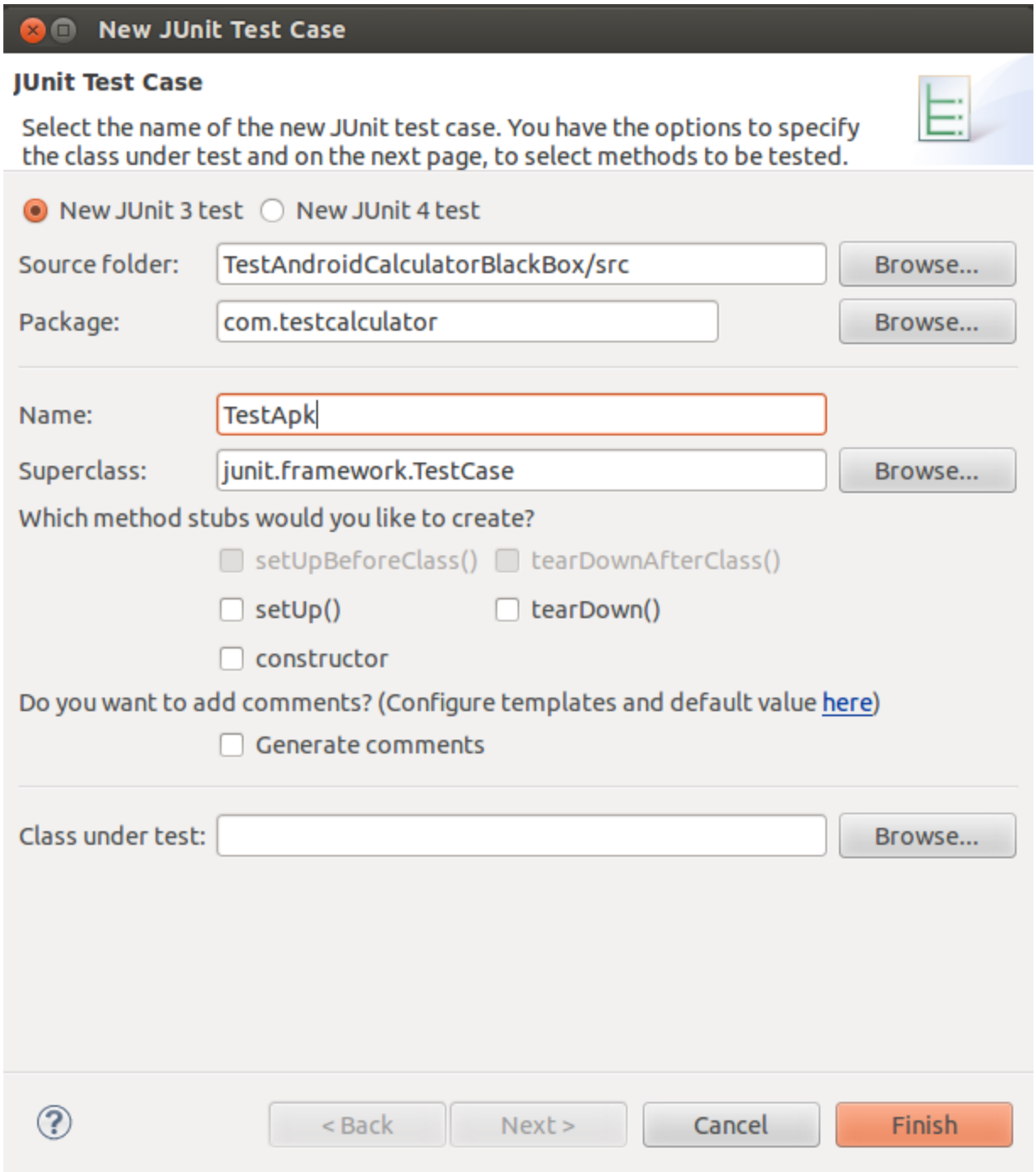
We can solve this issue by following any of the option,
1. Create another TestProject & eclipse will automatically get selected resource(for new one) & not show error for second created Test Project(we can use second one for our work)
2. First create an Android Project (we can also use Android Sample application bundled with Android SDK), run it, then create Test Project will not show error

To manually create package right click on project select New > Package. On 'New Java Package' window fill package name against 'Name:'. Like to test AndroidCalculator which has com.calculator package name, TestProject should be com.testcalculator or com.calculator.test package name



3. Create Test Class

Right click on com.testcalculator package, from *New* click on *Class* to add class. Enter class name TestApk (one can put and any name suits) and click on *Finish*



4. Code Test Class

Enter following code into new created TestApk class and save it

```
package com.testcalculator;
import com.jayway.android.robotium.solo.Solo;
import android.test.ActivityInstrumentationTestCase2;

@SuppressWarnings("unchecked")
public class TestApk extends ActivityInstrumentationTestCase2 {
	private static final String LAUNCHER_ACTIVITY_FULL_CLASSNAME = "com.calculator.Main";
	private static Class launcherActivityClass;
	static {
		try {
			launcherActivityClass = Class
					.forName(LAUNCHER_ACTIVITY_FULL_CLASSNAME);
		} catch (ClassNotFoundException e) {
			throw new RuntimeException(e);
		}
	}

	public TestApk() throws ClassNotFoundException {
		super(launcherActivityClass);
	}

	private Solo solo;
	@Override
	protected void setUp() throws Exception {
		solo = new Solo(getInstrumentation(), getActivity());
	}

	public void testDisplayBlackBox() {
		// Enter any integer/decimal value for first edit-field, we are writing  10
		solo.clearEditText(0);
		solo.enterText(0, "10");

		// Enter any integer/decimal value for first edit-field, we are writing  20
		solo.clearEditText(1);
		solo.enterText(1, "20");

		// Tap on Multiply button
		solo.clickOnButton("Multiply");
```

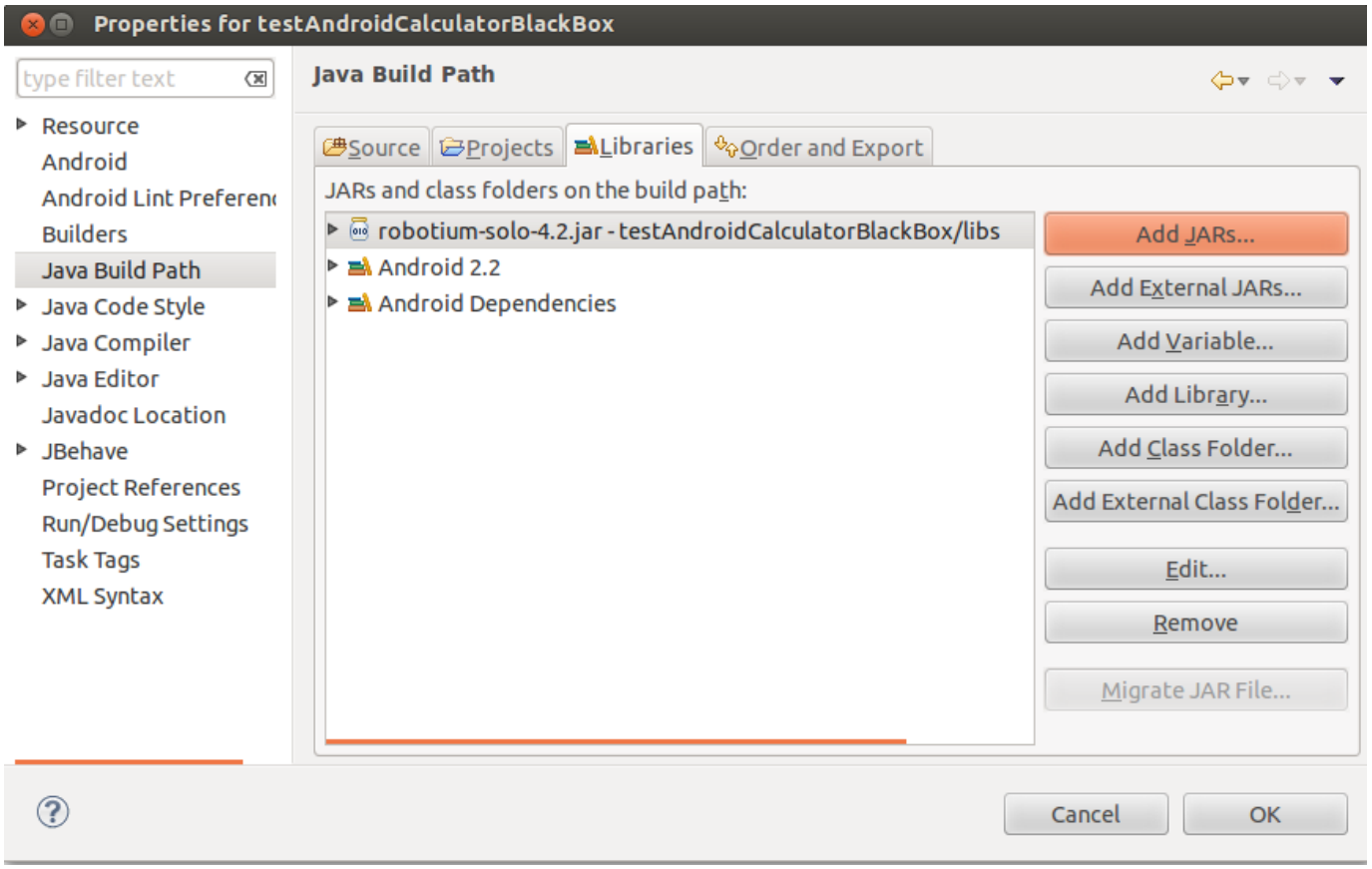
```
		// Verify that resultant of 10 x 20
		assertTrue("Problem asserting multiply", solo.searchText("200"));
	}

	@Override
	public void tearDown() throws Exception {
		solo.finishOpenedActivities();
	}
}
```

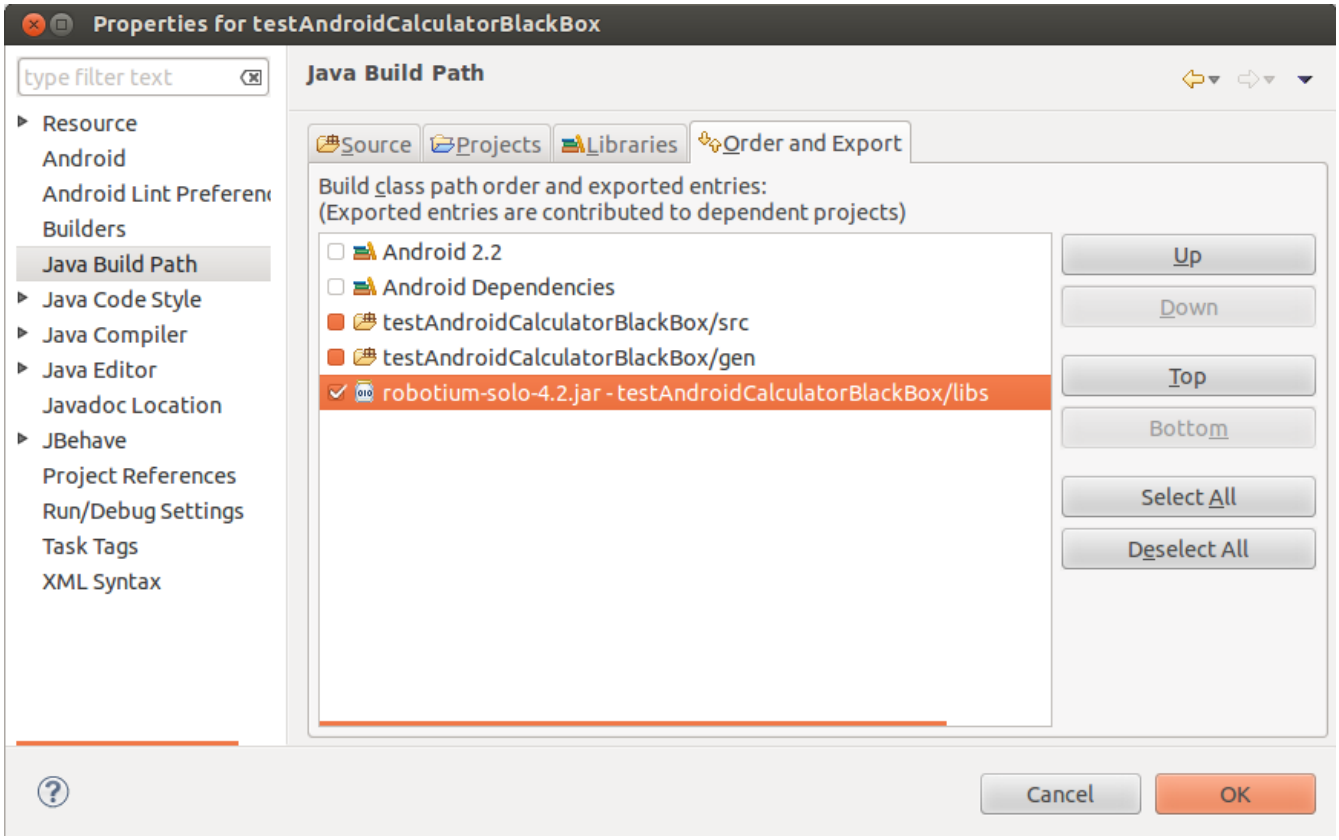
5. Add Robotium jar

Right click on project (AndroidCalculatorTestApk) select *Build Path*, and then click on *Configure Build Path* option.
On *Properties* window click on *Libraries* tab and add *Robotium latest* jar into project

Download Robotium jar from http://code.google.com/p/robotium/downloads/list



Note: In the latest Android SDK versions(17 or above) a **java.lang.NoClassDefFoundError: com.jayway.android.robotium.solo.Solo** error is shown if the Robotium jar is not exported . To fix the issue, after adding the Robotium jar go to the "Order & Export" tab and click the check-box besides the Robotium Jar and then click "OK". Please see the screenshot below.



6. Targeting AndroidManifest.xml to apk

From project explorer window open AndroidManifest.xml file

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
      package="com.testcalculator"
      android:versionCode="1"
      android:versionName="1.0">
    <application android:icon="@drawable/icon" android:label="@string/app_name">

    <uses-library android:name="android.test.runner" />
    </application>
    <uses-sdk android:minSdkVersion="8" />
    <instrumentation android:targetPackage="com.calculator" android:name="android.test.InstrumentationTestRunner" />
```

Put ‘com.calculator’ as value of following parameter like above

<instrumentationandroid:targetPackage="*com.calculator*"

7. Run your test

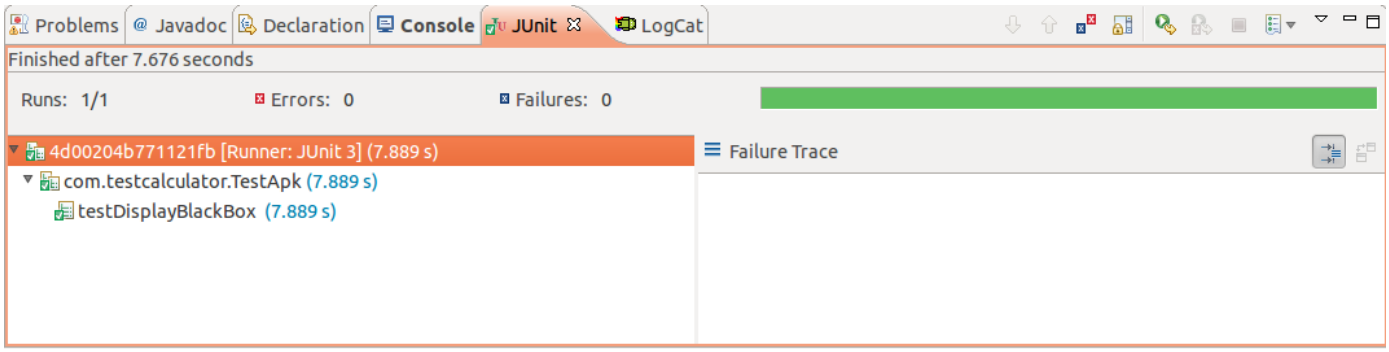
Its time to run test, now right click on *AndroidCalculatorTestApk* project and Run As *AndroidJUnit* Test. Wait for some time, it will automatically load AndroidCalculator.apk (installed on emulator) and

* Enter the first & second values into editfields

* Click on Multiply button

* Verify their multiply value

After complete verification it will show the report like below



Test can also be run using command prompt/terminal by following simple steps

* Write following command to install AndroidCalculator apk on emulator

> adb install <path>/AndroidCalculator.apk

* Write following command to install AndroidCalculatorTest apk on emulator

*> adb install <path>/*TestAndroidCalculatorBlackBox.apk

* Run the test cases:

> adb shell am instrument -w com.testcalculator/android.test.InstrumentationTestRunner