Hello, Multiscreen Applications

Getting Started - 4

Sample Code:

- HelloMultiScreen.zip

Related Articles:

- Installation
- Hello, Android
- Activity Lifecycle

Related SDK:

- Android Application Fundamentals
- Intents and Intent Filters
- AndroidManifest.xml

This is the third article in the Xamarin.Android getting started series. It examines the constituent pieces of an Android application and introduces Android Activities and Intents, and demonstrates how to launch Activities in order to create applications that have multiple screens. It also shows how to use Intents to pass information between screens.

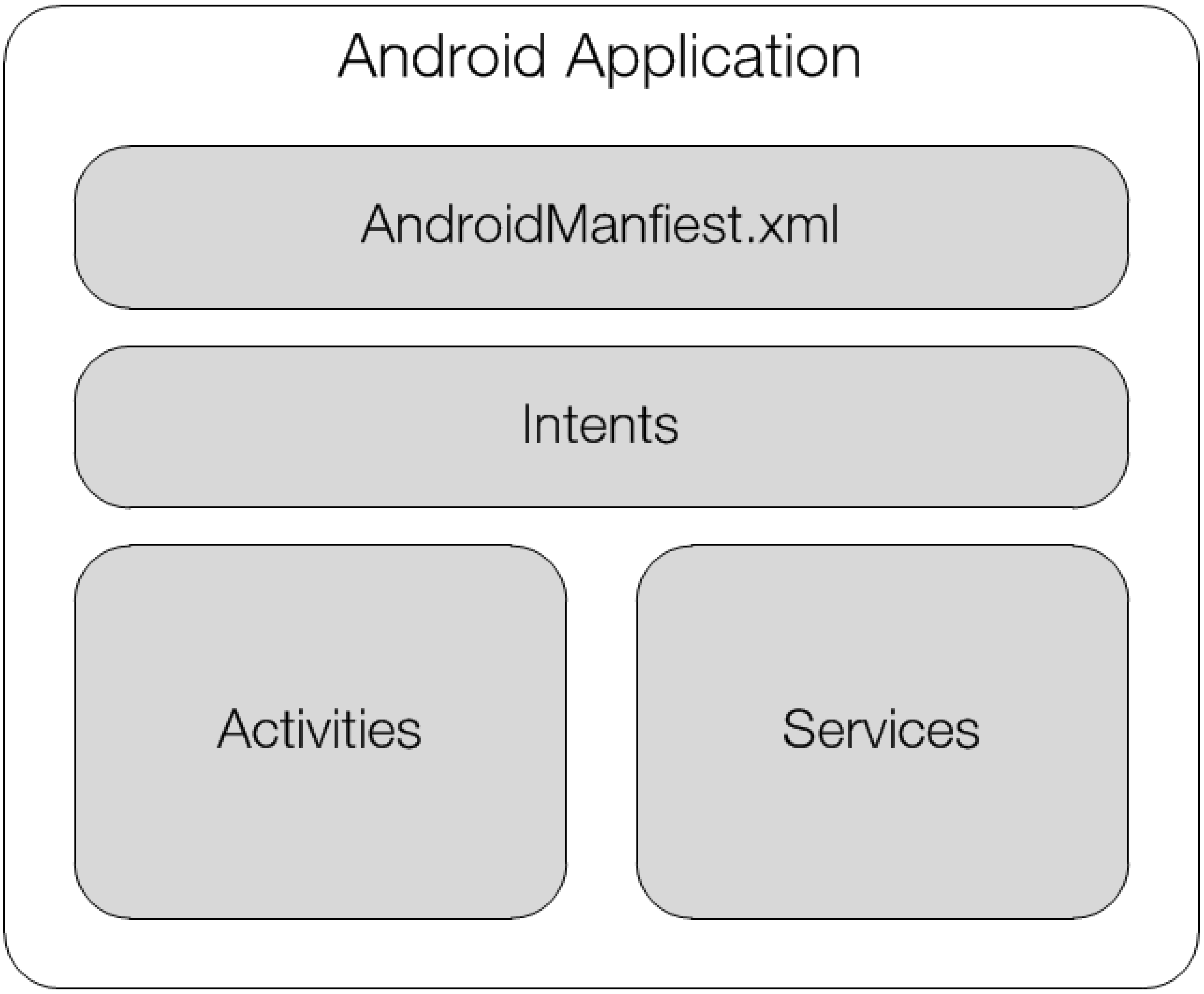
Overview

In this article we'll look at how to create multi-screen applications using Xamarin.Android and walk through the creation of a simple multi-screen app. We'll introduce *Intents* and show how they can be used to load additional Activities. However, before we dive into creating the application, let's examine the constituent pieces of an Android application.

Anatomy of an Android Application

Android applications are very different from traditional client applications found on platforms such as Windows, Mac OSX and even mobile platforms such as iOS. These platforms have a single entry point into the application in the form of a static main function, which creates an instance of an application that then launches, loads and manages its screens, etc. By contrast, Android applications consist of a set of loosely coupled screens, represented by Activity classes, and Service classes, which are long-running background processes. This is somewhat similar to web applications (in that they can be started from various URLs), except that typically, even web applications retain an application instance.

The following diagram illustrates the components of a basic Android application:



This loosely coupled architecture presents an interesting problem for multi-screen applications. Since each Activity is essentially decoupled from the others, there needs to be a way to launch them and optionally pass data to them. On Android this is accomplished using *Intents*. Intents are classes that describe a message: both what the desired action of the message is and a data payload to send along with it.

Let’s explore Activities and Intents a little more.

Activities

As mentioned, Activities are classes that provide an interface. An Activity is given a window in which to add User Interface to. Therefore, creating multi-screen applications involves creating multiple Activities and transitioning between them.

The Activity class inherits from the abstract Context class.

Context

Context is the closest Android gets to a reference to the current application and provides a mechanism for accessing the Android system. A Context is needed to perform many operations in Android such as:

- Accessing Android services

- Accessing preferences
- Creating views
- Accessing Device Resources

An Android application needs a Context to know what permissions the application has, how to create controls, accessing preferences, etc. However, because (as we mentioned above), Android apps are a set of loosely coupled Activities and Services, no single static application Context exists. Therefore, each Activity and Service inherits from Context, which has all the information the application needs. Every time a new Activity is created, it's passed a Context from the Activity that created it.

Since Activity derives from Context, any call that takes a Context as an argument can take an Activity.

Activity Lifecycle Overview

Every Activity has a lifecycle associated with it, ranging from creation to destruction. Activities can be paused or destroyed by the system at any time. The lifecycle provides a way for Activities to handle the various lifecycle methods that Android will call and gives them an opportunity to save or rehydrate state, so screens can continue to operate normally. After completing this Getting Started series, we highly recommend checking out the Activity Lifecycle document for a detailed discussion on the subject.

Intents

Intents are used throughout Android to make things happen by sending messages. Intents are most commonly used within applications to launch Activities. To launch a new Activity, we create a new Intent, set the Context and the Activity class to launch and then tell the OS to handle the Intent, which launches the Activity.

Additionally, Intents can be used to tell the OS to launch external Activities as well. For example, an application can have the intention to dial a phone number when the user taps a button. The way an application announces this intention is via an Intent for a phone dialing action. However, the actual dialing of the number is handled by an Activity in the Phone Dialer Application.

AndroidManifest.xml

Every Android application needs to include a file called AndroidManifest.xml. This file contains information about the application such as:

- **Component Registration -** The components that make up the app, including registration of Activities and Intents.
- **Required Permissions -** The permissions the app requires.
- **OS Version Compatibility -** The minimum Android API level the application supports.

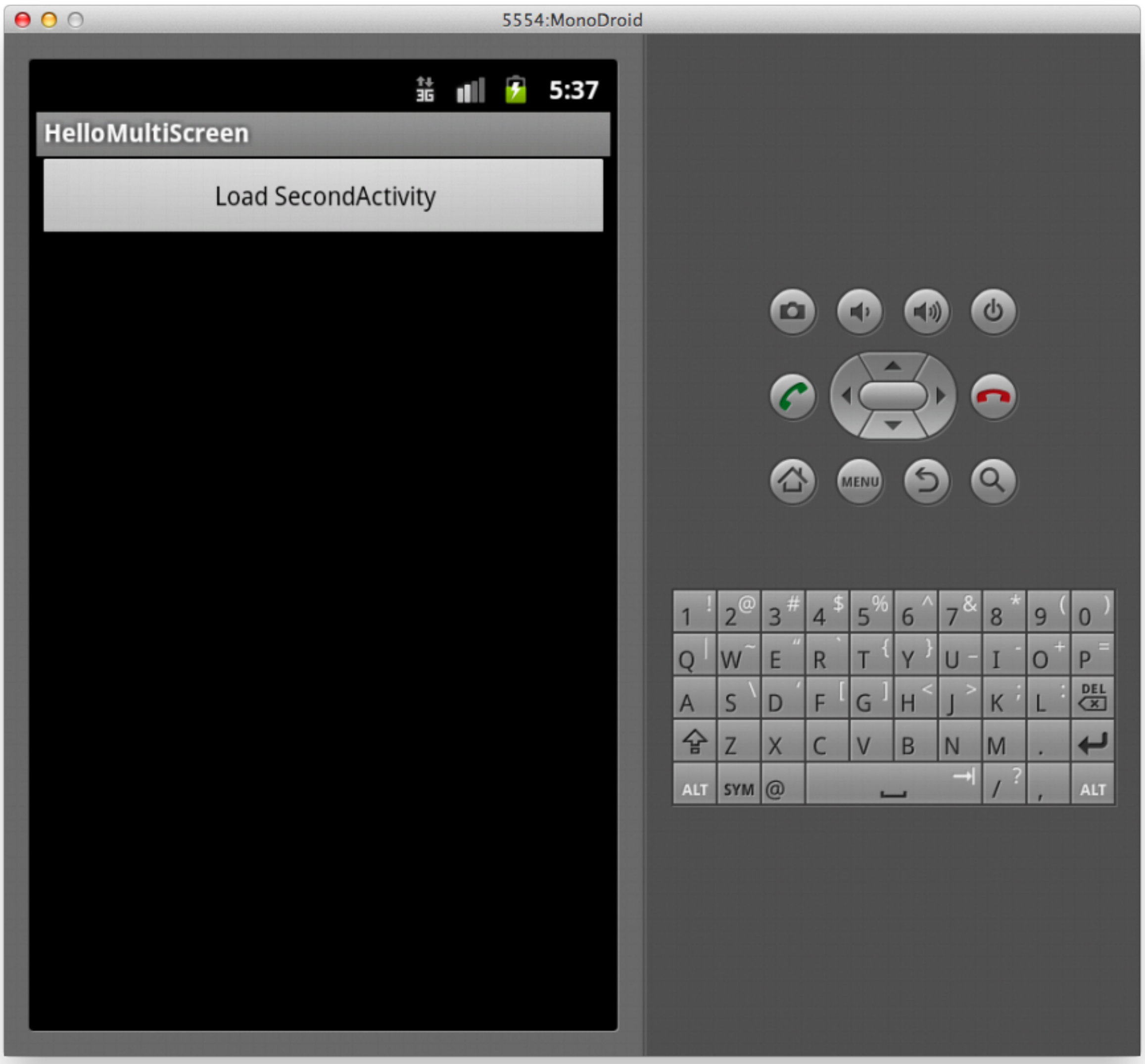
We'll examine the manifest more later on in this document during the application walkthrough. For more details see the AndroidManifest.xml documentation on the Android Developers' site.

Application Walkthrough

Now that we've covered some concepts to understand the strangeness of Android applications, let's create a simple, multi-screen application.

We are going to make a new application where the first Activity will include a button. Tapping the button will result in another Activity loading. For this example, we'll demonstrate loading a second Activity explicitly from a class defined within the application.

Here is a screenshot showing the application after it is launched:



Creating the Application

To get started, let's create a new Xamarin.Android application named HelloMultiScreen using the Xamarin.Android Application template. Please refer to the Hello, Android tutorial if you need a review of how to create a project. The project template will create an application with an Activity class named Activity1 in the file Activity1.cs. Open the file and right-click on the Activity1 class name, selecting Refactor > Rename from the context menu. Rename the Activity1 class included by the template to FirstActivity. If you are using Visual Studio, also rename the file in the Solution Explorer.

Before we add any code, let's examine the ActivityAttribute the template added to the FirstActivity class.

Using ActivityAttribute

Notice the FirstActivity class is decorated with an ActivityAttribute as shown below:

```
[Activity (Label = "HelloMultiScreen", MainLauncher = true)]
public class FirstActivity : Activity
```

We mentioned earlier that Activities have to be registered in the AndroidManifest.xml file in order for them to be located by the OS, and the ActivityAttribute aids in doing just that. During compilation, the Xamarin.Android build process gathers all the attribute data from all the class files in the project and then creates a new AndroidManifest.xml which is based on the AndroidManifest.xml file in the project, but with the attribute data merged in. It then bundles that manifest into the resulting compiled application (apk file).

By using C# attributes, Xamarin.Android is able to keep the declarative information used to register an Activity together with the class definition. Failure to include this attribute will result in Android not being able to locate the Activity, since it would not be registered with the system.

Additionally, the attribute has MainLauncher set to true. This results in the Activity being registered as launchable. During installation of an app, Android will populate the application launcher with the icon of the launchable Activity.

Manifest File

When the ActivityAttribute is merged into the manifest, it will result in XML similar to the following:

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
package="hellomultiscreen.hellomultiscreen" >
    <uses-sdk android:minSdkVersion="11" />
    <application android:icon="@drawable/icon"
        android:label="HelloMultiScreen">
        <activity android:name="FirstActivity"
            android:label="HelloMultiScreen">
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
</manifest>
```

In the XML above, FirstActivity is registered with the system as being enabled for launch using an intent filter, with the intent filter's action set to android.intent.action.MAIN and its category set to android.intent.category.LAUNCHER. Intent filters register what things a particular Activity can support, such as being able to handle application launch and serving as the entry point in this case.

Adding the UI Markup

In the Hello, Android tutorial, we saw how to create our UI in either code or declaratively using a special XML format called Android XML, saved in files with an axml extension. Let’s use the declarative approach here.

We are going to add a button control to a LinearLayout. Recall from the Hello, Android tutorial that Android uses layout classes to group and position controls on the screen. Any controls we add, such as the Button, will be children of the layout. The LinearLayout class is used to align controls one after another, either horizontally, or vertically.

To include the button in the FirstActivity, add the following code to Main.axml:

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent">
    <Button
        android:id="@+id/showSecond"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="Load SecondActivity"/>
</LinearLayout>
```

Implementing the First Activity

Now that we have our UI defined, we want the button included in Main.axml to be created by FirstActivity when the application loads.

When the application loads, FirstActivity’s OnCreate method is called. Whether we create our UI programmatically or declaratively, we need to load it in OnCreate. Add the following code to load the UI from Main.axml and handle the button’s click event:

```
protected override void OnCreate (Bundle bundle)
{
    base.OnCreate (bundle);
    //Use UI created in Main.axml
    SetContentView (Resource.Layout.Main);

    var showSecond = FindViewById<Button> (Resource.Id.showSecond);
    showSecond.Click += (sender, e) => {
        StartActivity (typeof(SecondActivity));
    };
}
```

Let’s break this code down line-by-line.

The code first loads the UI created in Main.axml with this line:

```
SetContentView (Resource.Layout.Main);
```

Next, it gets a reference to the button with id showSecond that we added in Main.axml using the FindViewById method as shown:

```
var showSecond = FindViewById<Button> (Resource.Id.showSecond);
```

Using the button reference, an event handler is created to start an instance of SecondActivity, as shown below:

```
showSecond.Click += (sender, e) => {
    StartActivity(typeof(SecondActivity));
};
```

This code uses the overloaded version of StartActivity that takes the type of Activity to start. Under the hood, an Intent is created, with the current Activity passed as the Context. This method is an optimization on top of the underlying Android API, which requires an explicit Intent to be created and the context passed, as in the following:

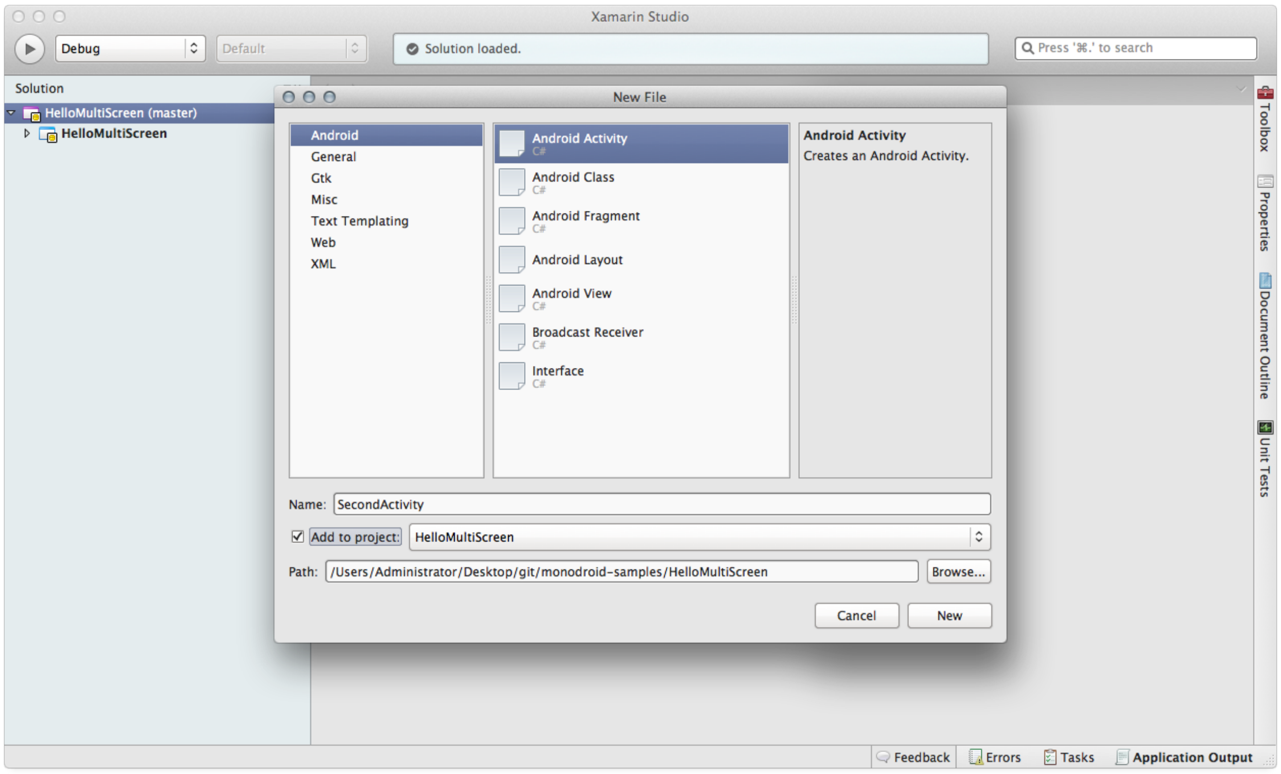
```
var second = new Intent(this, typeof(SecondActivity));
StartActivity(second);
```

This longer form is useful when needing control over the Intent instance, such as we'll see later when we pass data between Activities.

Creating a Second Activity

With the code in place to launch an instance of SecondActivity, let's now create the SecondActivity class.

The SecondActivity class is defined by the application. To create it, add a new Activity using Xamarin Studio from the File &gt; New &gt; File menu. Then, in the New File dialog, choose C# &gt; Android in the left pane and select Android Activity for the file template, as shown below:



Android Activity
Creates an Android Activity.

Name: SecondActivity

[✓] Add to project: HelloMultiScreen

Path: /Users/Administrator/Desktop/git/monodroid-samples/HelloMultiScreen

Name the file SecondActivity and click New to create it. Make sure the Add to Project box is checked.

Adding a Layout

The SecondActivity will include a TextView inside a LinearLayout. Add a new file to the layout folder in Xamarin Studio named Second.axml and include the following XML:

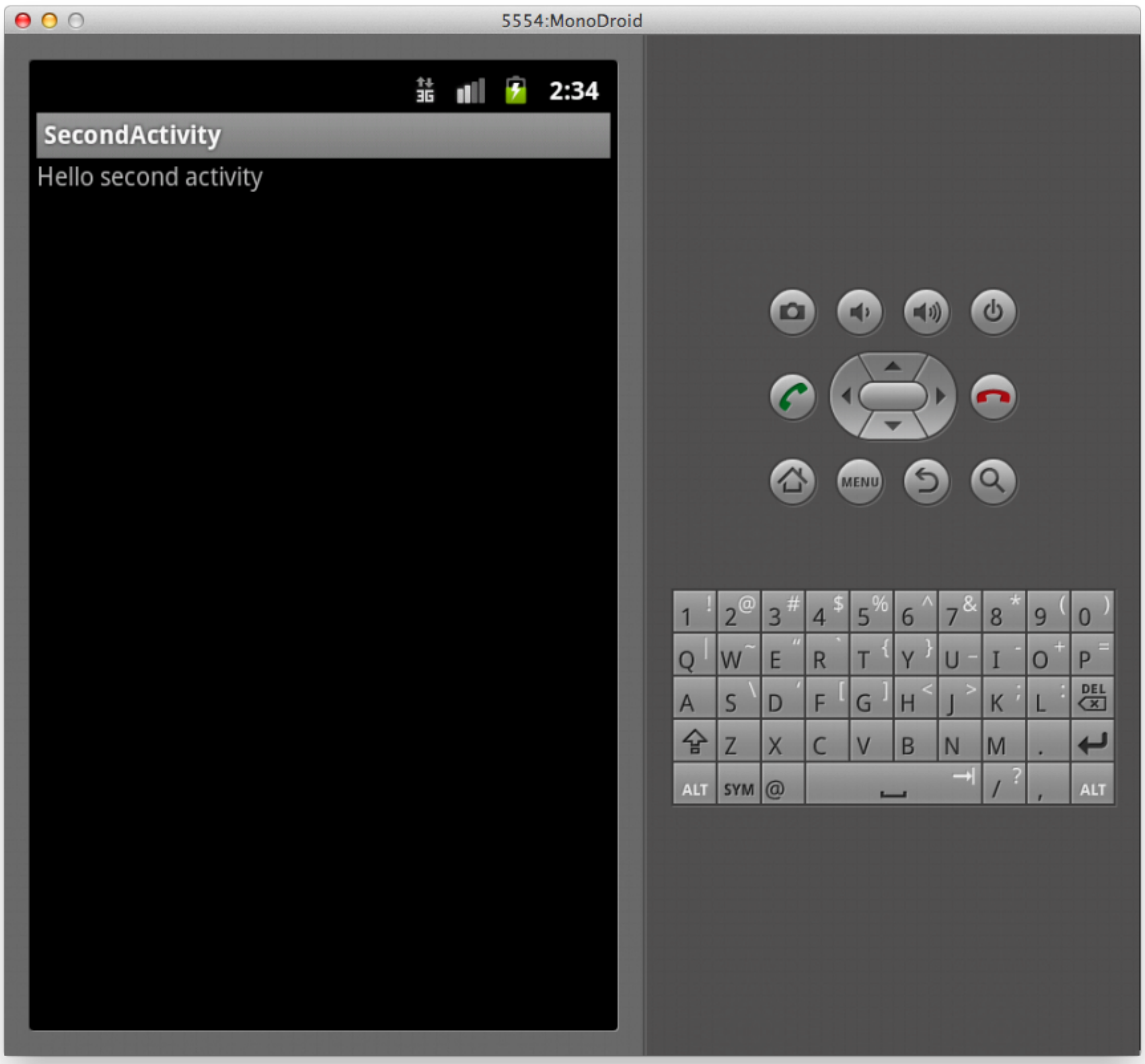
```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    android:orientation="vertical"
    android:layout_width="fill_parent"
    android:layout_height="fill_parent">
    <TextView
        android:id="@+id/screen2Label"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="Hello second activity" />
</LinearLayout>
```

Loading the UI from the Second Activity

Finally, load the UI from Second.axml when SecondActivity is loaded by calling SetContentView in SecondActivity's OnCreate method as shown below:

```
[Activity (Label = "SecondActivity")]
public class SecondActivity : Activity
{
    protected override void OnCreate (Bundle bundle)
    {
        base.OnCreate (bundle);
        // Create your application here
        SetContentView (Resource.Layout.Second);
    }
}
```

Running the application and clicking the showSecond button results in the SecondActivity loading as shown in the screenshot below:



Now that we've seen how to load multiple Activities, let's go a step further and show how to pass data between Activities.

Sending Data Between Activities

We can use the PutExtra method of an Intent to send a data payload with an Intent. For example, change the button click event code in the FirstActivity class as follows:

```
showSecond.Click += (sender, e) => {
    var second = new Intent(this, typeof(SecondActivity));
    second.PutExtra("FirstData", "Data from FirstActivity");
    StartActivity(second);
};
```

In the code above we use the longer form of creating Intent and passing it to StartActivity. The other new thing introduced here is the line:

```
second.PutExtra("FirstData", âdata from FirstActivityâ);
```

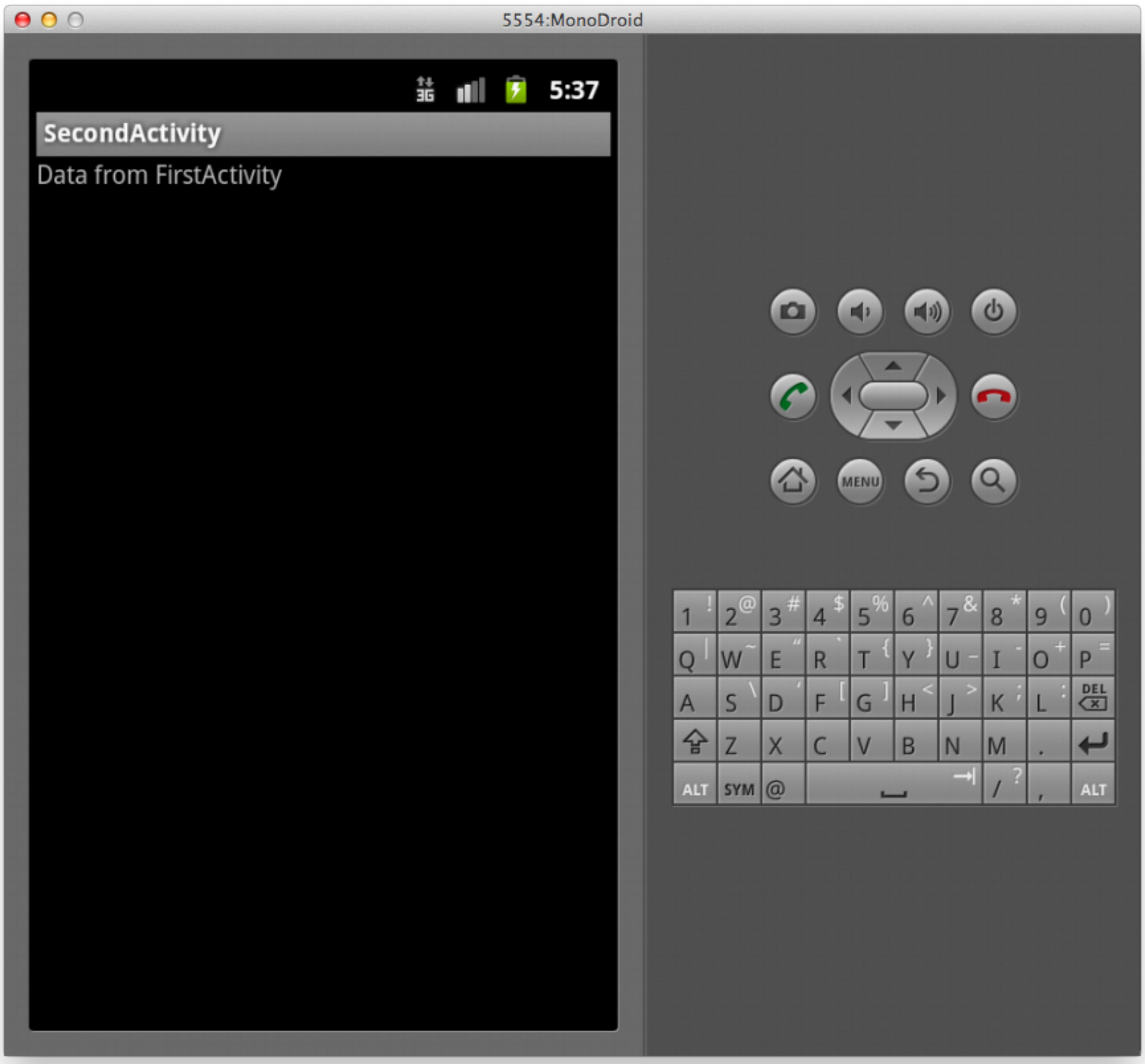
This code adds a string to include with the Intent. The design is similar to how web applications pass data between pages using query strings or form data. In addition to strings, the PutExtra method also includes several overloads for passing data of various types.

In the SecondActivity class, we simply use the TextView to show the string sent with the Intent as follows:

```
var label = FindViewById<TextView> (Resource.Id.screen2Label);
label.Text = Intent.GetStringExtra("FirstData") ?? âData not availableâ;
```

We call Intent.GetStringExtra(âFirstDataâ) to pull out the data that we passed over from the FirstActivity. We used the null coalescing operator (“??”) there because when accessing Intent data, it may be null.

When the Activity loads, the text from the FirstActivity is displayed, as shown below:



Summary

In this article we examined the constituent parts that make up an Android app, and how they work together. We showed how Activities can be used to represent the screens in an Android application and how to use Intents to navigate between them. We also introduced the AndroidManifest.xml file and showed how Xamarin.Android uses C# attributes to make registering Activities in the manifest more concise. Finally, we examined how to include a data payload with an Intent in order to pass data between Activities.

Congratulations! If you've made it this far in the Getting Started with Xamarin.Android Series, you should now have a pretty good understanding of the basics of building Android applications.

We've got one more tutorial for you, named NextSteps , showing clear steps that will lead you to a set of focused jumping off points into the deep end of Android development.

Source URL: http://docs.xamarin.com/guides/android/getting_started/hello%2C_multi-screen_applications