Hello Android

Xamarin.Android Level 1, Chapter 1

Xamarin Inc.

Overview

In this chapter we'll look at how to create, deploy, and run a Xamarin.Android application. First, we'll demonstrate how to use the default application template in the deployment process. Next, we'll examine some of the basic parts of the android application that are created with the template. We'll then create a hello world application, showing how to build the user interface both in code and by using Android XML.

Creating a Xamarin.Android Application

To get started, we are going to walk through the steps you need to take to create a Xamarin.Android application and deploy it to the emulator. Xamarin.Android works with Xamarin Studio on both OSX and Windows; it also works on Windows with Visual Studio 2010 Professional (or greater). The process for creating Xamarin.Android applications is nearly the same on each of these platforms. This walkthrough assumes you already have Xamarin.Android installed and that you have created an emulator. If that's not the case, refer to the Installation document before continuing.

Creating a New Application

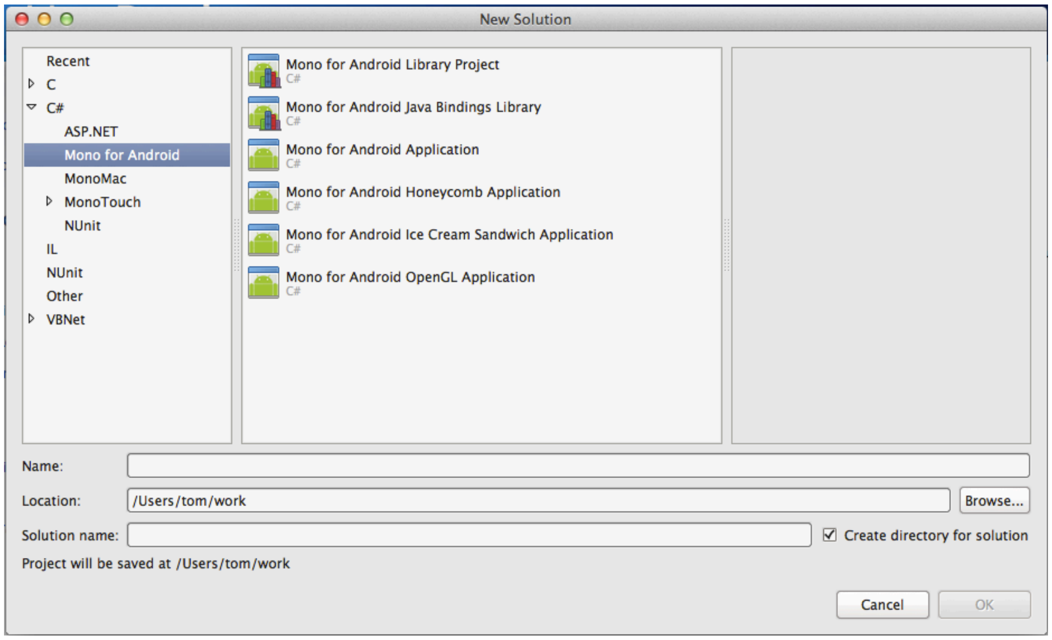
Let's begin by creating a new Xamarin.Android solution. Xamarin.Android includes several templates for creating projects, including:

- ➔ **Xamarin.Android Library Project** – A reusable .NET library project for Android.
- ➔ **Xamarin.Android Java Bindings Library** – A project for binding an existing JAR file or Android Library project so that it may be reused in a Xamarin.Android application.
- ➔ **Xamarin.Android Application** – A basic starter project with a single activity targeting Android 2.2.
- ➔ **Xamarin.Android Honeycomb Application** – A basic starter project with a single activity targeting Android 3.1.
- ➔ **Xamarin.Android Ice Cream Sandwich Application** – A basic start project with a single activity targeting Android 4.0.3.
- ➔ **Xamarin.Android OpenGL Application** – An OpenGL starter project.

We're going to use the *Xamarin.Android Application* template for this walkthrough. Let's create an application by doing the following:

NEW SOLUTION - XAMARIN STUDIO

1. From the **File** menu select **New > Solution**, bringing up the dialog shown below:


New Solution
Recent
C
C#
ASP.NET
Mono for Android
MonoMac
MonoTouch
NUnit
IL
NUnit
Other
VBNet
Mono for Android Library Project
C#
Mono for Android Java Bindings Library
C#
Mono for Android Application
C#
Mono for Android Honeycomb Application
C#
Mono for Android Ice Cream Sandwich Application
C#
Mono for Android OpenGL Application
C#
Browse...
Cancel
OK

Name:

Location: /Users/tom/work

Solution name:

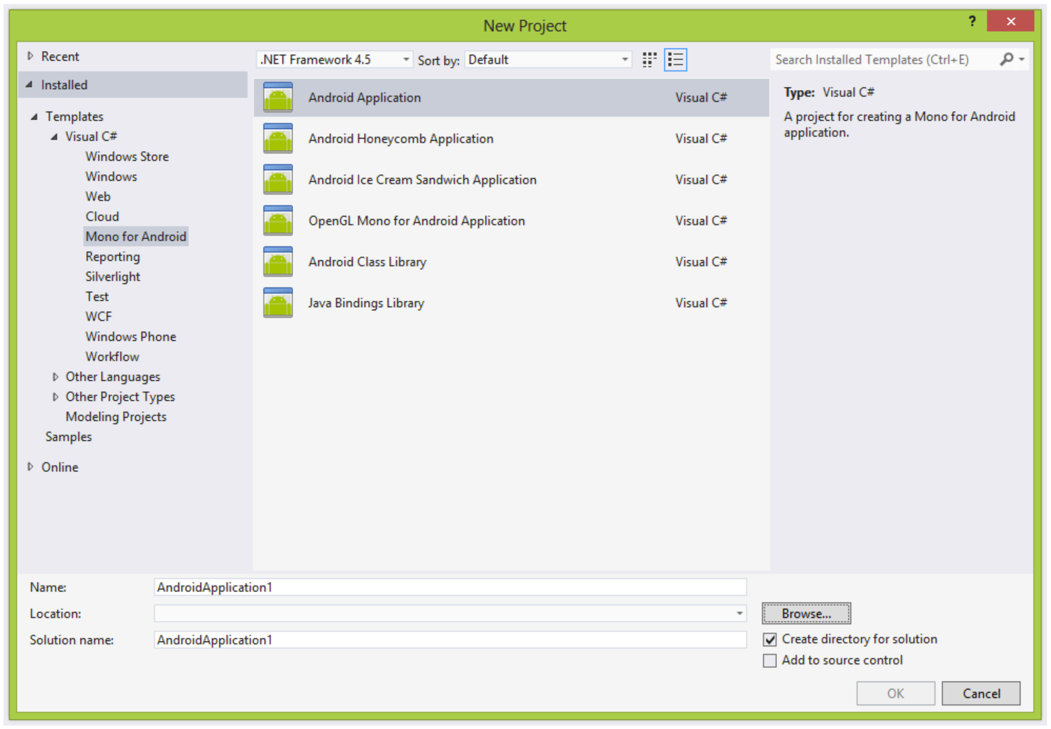
☑ Create directory for solution

Project will be saved at /Users/tom/work

2. Expand the **C#** item in the tree on the left.
3. Choose **Xamarin.Android**, and select the **Xamarin.Android Application** template from the list on the right.
4. Enter `HelloM4A` for the project name, and then click **OK**.

NEW SOLUTION – VISUAL STUDIO

1. From the **File** menu select **New>Project**, bringing up the **New Project** dialog shown below:


New Project
?
✕
Recent
Installed
Templates
Visual C#
Windows Store
Windows
Web
Cloud
Mono for Android
Reporting
Silverlight
Test
WCF
Windows Phone
Workflow
Other Languages
Other Project Types
Modeling Projects
Samples
Online
.NET Framework 4.5
Sort by: Default
Search Installed Templates (Ctrl+E)
Android Application Visual C#
Android Honeycomb Application Visual C#
Android Ice Cream Sandwich Application Visual C#
OpenGL Mono for Android Application Visual C#
Android Class Library Visual C#
Java Bindings Library Visual C#
Browse...
OK
Cancel

Type: Visual C#

A project for creating a Mono for Android application.

Name: AndroidApplication1

Location:

Solution name: AndroidApplication1

☑ Create directory for solution

☐ Add to source control

2. Expand **Visual C#** under **Installed Templates**.
3. Choose **Xamarin.Android**, and then select the **Xamarin.Android Application** template.
4. Enter `HelloM4A` for the **Name**, enter a **Location**, and then click **OK**.

SOLUTION COMPONENTS

In the previous section, we created a simple Xamarin.Android project. In doing so, Xamarin.Android generated a variety of things for us. Let's take a look at what it created.

The HelloM4A project includes three folders named Assets, Properties, and Resources. These items are summarized in the table below:

Folder	Purpose
Assets	Contains any type of file the application needs included in its package. Files included here are accessible at runtime via the `Assets` class. These files may be organized into a folder hierarchy
Properties	Contains normal .NET assembly metadata.
Resources	Contains application resources such as strings and images, as well as declarative XML user interface definitions. These resources are accessible through the generated `Resource` class.

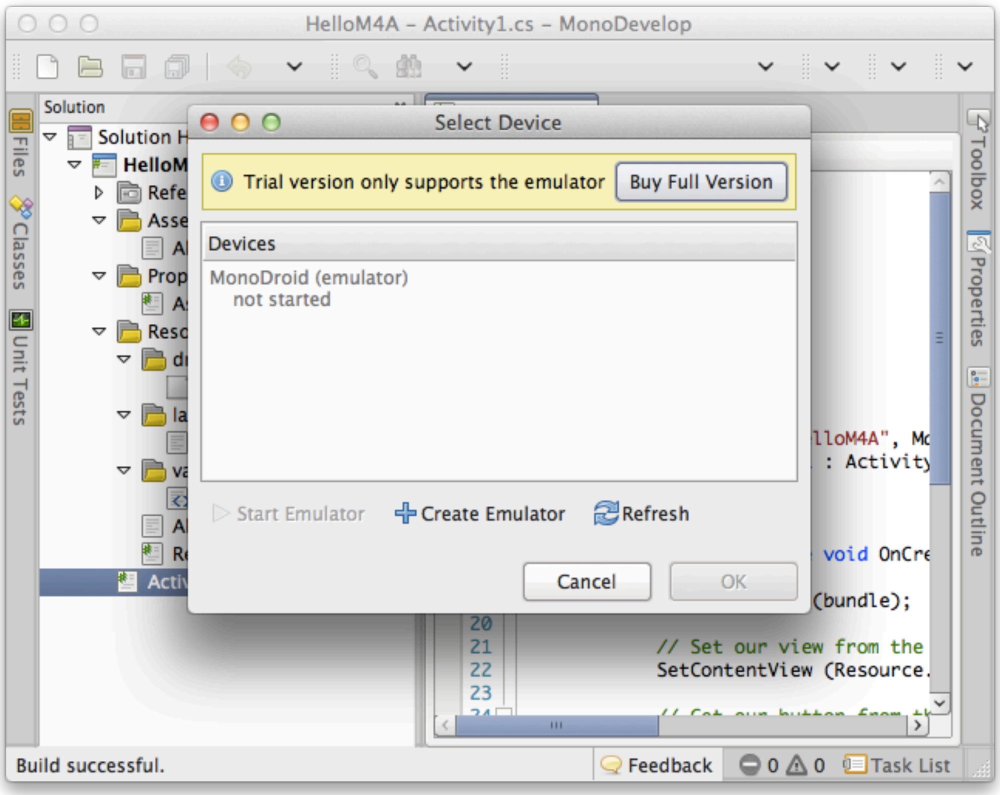
The project template also created a class called `Activity1` in the file `Activity1.cs`. An `Activity` is a class that models a destination where a user can perform some action while using an app, typically via a user interface.

Conceptually, an activity can be thought of as being mapped to an application screen. An activity is similar in some ways to a *Page* in *ASP.NET*, in that every activity has a lifecycle associated with it. An `Activity` contains methods to be called at certain points in the lifecycle. These methods can also be overridden. For example, the Activity subclass created by the project template overrides the `OnCreate` method, which is called after an `Activity` first starts. If you want to learn more about activities after you finish the Getting Started series, we recommend reading the Activity Lifecycle article.

Before we begin to implement our own simple Hello, World app, let's run the application as created from the template. This will let you see a good example of the running app and it will help you become familiar with the process of deploying and launching in the emulator.

LAUNCHING THE EMULATOR - XAMARIN STUDIO

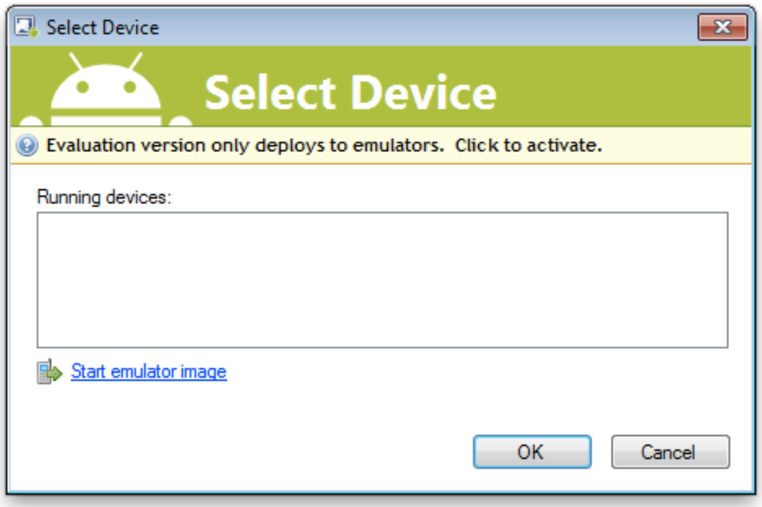
Under the Xamarin Studio **Run** menu, you have the options to either **Run** or **Debug**. **Debug** will attach the application to the debugger after it launches. For now, let's just select **Run**. This will launch the **Select Device** dialog as shown below:



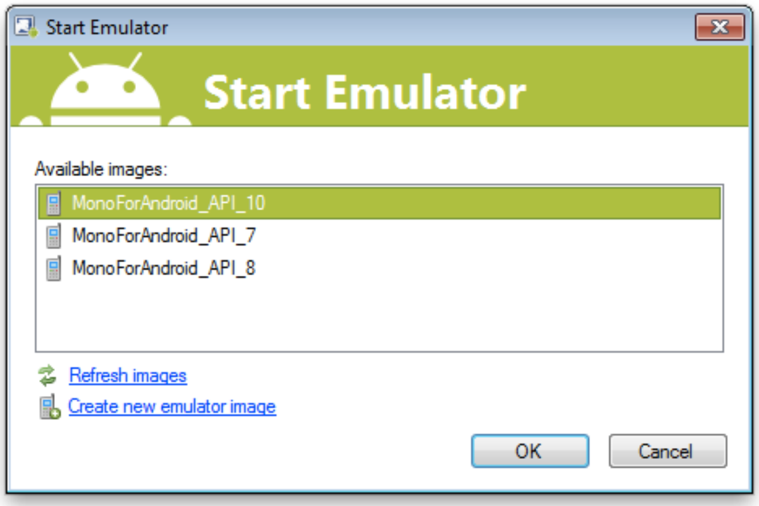
Xamarin.Android will take care of launching the emulator for us. Simply select the emulator in the list and choose Start Emulator.

LAUNCHING THE EMULATOR – VISUAL STUDIO

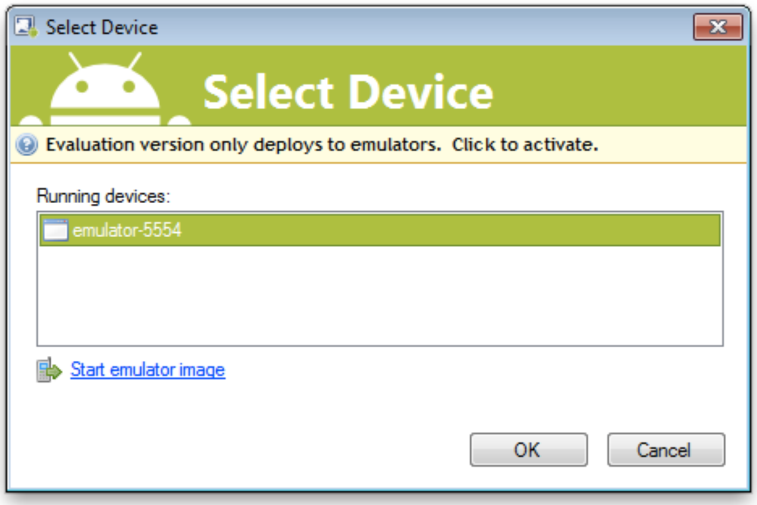
We can run the app as usual in Visual Studio by choosing Debug > Start Without Debugging (or Start Debugging to run with the debugger attached). Visual Studio will launch the Select Device dialog as shown below:



Selecting Start emulator image in this dialog will open a list of available emulators:



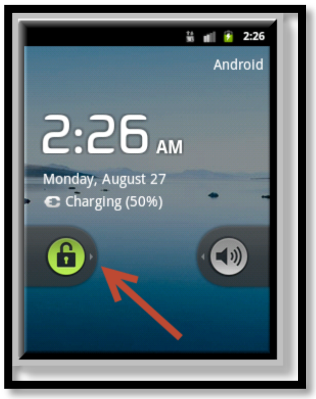
When we choose the emulator we want to run, which by default should be an emulator with an API level >= 8, and then click **OK**, Xamarin.Android launches the emulator. After it starts up, the emulator will appear in the **Running devices** list as shown below:

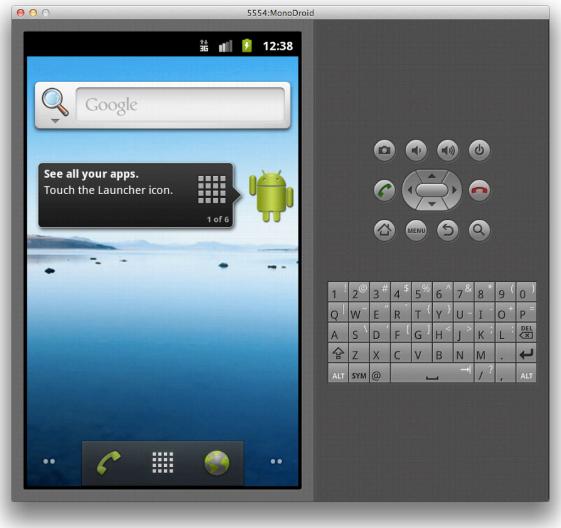


Evaluation version only deploys to emulators. Click to activate.

Deploying and Launching the Application

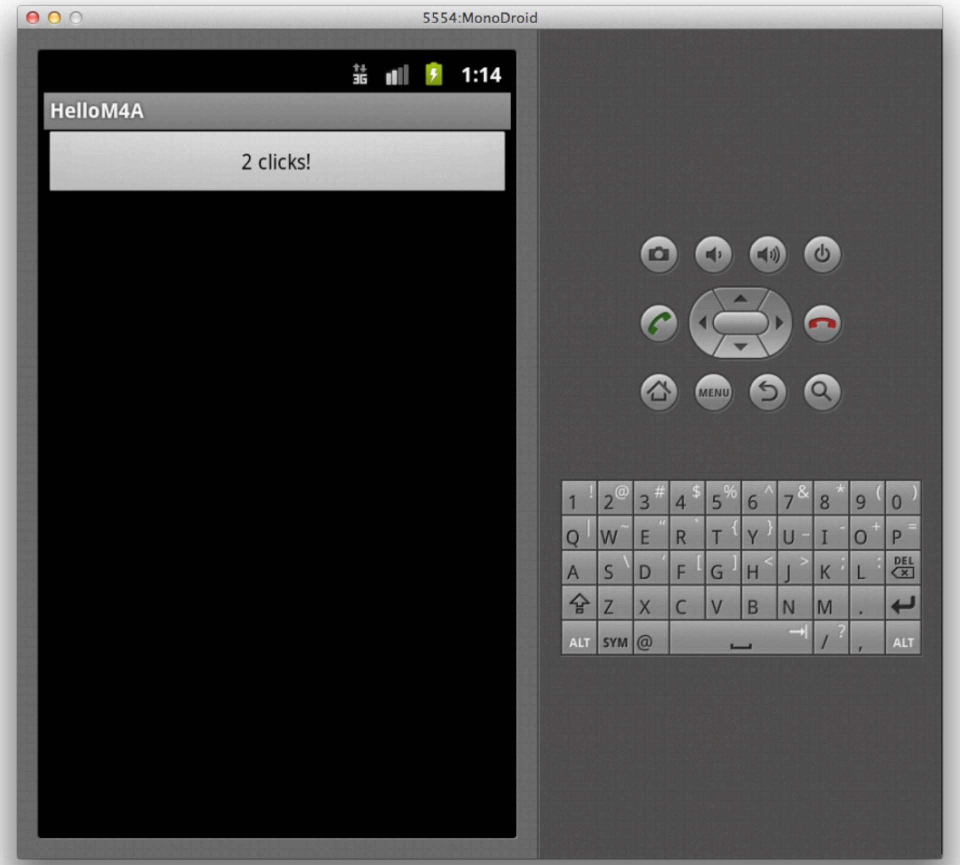
The emulator takes a while to launch, so you might consider leaving it running after it starts up. You don't need to shut it down to redeploy your app. After the emulator starts up, slide the lock button to the right to show the Android home screen:





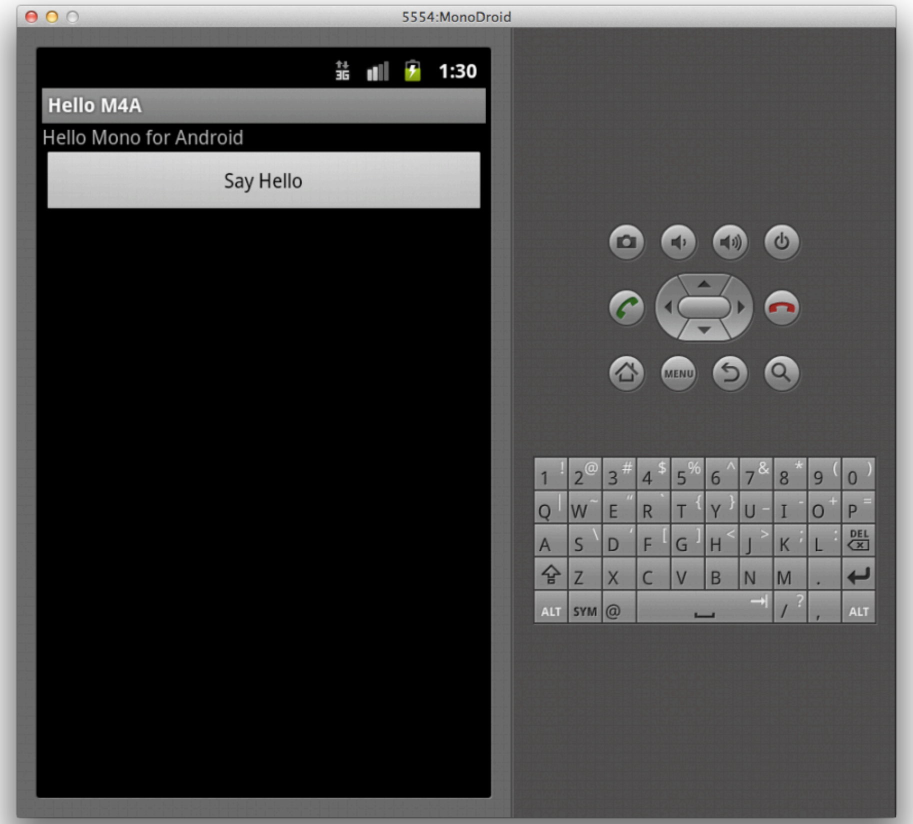
Back in the **Select Device** dialog, we can now build and deploy our app by selecting the emulator in the list, and then clicking **OK**. The first time a Xamarin.Android application is installed, the Xamarin.Android shared runtime will be installed, followed by the application. **Installing the runtime only happens for the first Xamarin.Android app deployed to the emulator. It may take a few moments, so please be patient.** Subsequent deployments will only install the app.

Xamarin.Android deploys the app to the emulator, and then launches it. The default app created from the template consists of a `Button`. Clicking the button increments a counter, as shown below:



Hello, World Walkthrough

The default application template we looked at earlier provides a good starting point for creating a simple hello world application. In order to fully explore how to put an application together ourselves, we're first going to create a simple application consisting of a `TextView` and a `Button`. Clicking the button will change the text of the `TextView`. Here is a screenshot that shows the application running in the emulator:



Creating the User Interface with Code

Now let's create the user interface in code. Earlier, we talked briefly about `Activities` and mentioned that activities have a lifecycle. After an `Activity` starts, its `OnCreate` method is called. This is the appropriate place to perform initialization of the application, such as loading the user interface for the `Activity`.

For our app, we need to create a `Button` and a `TextView`. When the user clicks the button, we want the `TextView` to display a message. To accomplish this, open the `Activity1.cs` file and replace the `OnCreate` method with the following code:

```
protected override void OnCreate (Bundle bundle)
{
    base.OnCreate (bundle);

    //Create the user interface in code
    var layout = new LinearLayout (this);
    layout.Orientation = Orientation.Vertical;

    var aLabel = new TextView (this);
    aLabel.Text = "Hello, Xamarin.Android";

    var aButton = new Button (this);
    aButton.Text = "Say Hello";
```

```
        aButton.Click += (sender, e) => {
            aLabel.Text = "Hello from the button";
        };

        layout.AddView (aLabel);
        layout.AddView (aButton);

        SetContentView (layout);
    }
```

Let's break this code down line-by-line. First we created a `LinearLayout` and set its `Orientation` to `Vertical` with these lines:

```
var layout = new LinearLayout (this);
layout.Orientation = Orientation.Vertical;
```

Android uses layout classes to group and position controls on the screen. The controls we add, such as the `Button` and the `TextView`, will be children of the layout. The `LinearLayout` class is used to align controls one after another, either horizontally, or vertically as we have done here. This is similar to a `StackPanel` in *Silverlight*.

Next, we created a `Button` and `TextView`, setting the `Text` property of each like this:

```
var aLabel = new TextView (this);
aLabel.Text = "Hello, Xamarin.Android";

var aButton = new Button (this);
aButton.Text = "Say Hello";
```

When the user clicks the button, we want to change the text of the `TextView`. With Xamarin.Android, we accomplish this by using a typical .NET event. To handle such an event, we can use an event handler, an anonymous method, or even a lambda expression as in the following example:

```
aButton.Click += (sender, e) => {
    aLabel.Text = "Hello from the button";
};
```

Instead, we could use a C# 2.0 anonymous method with the delegate syntax:

```
aButton.Click += delegate(object sender, EventArgs e) {
    aLabel.Text = "Hello from the button";
};
```

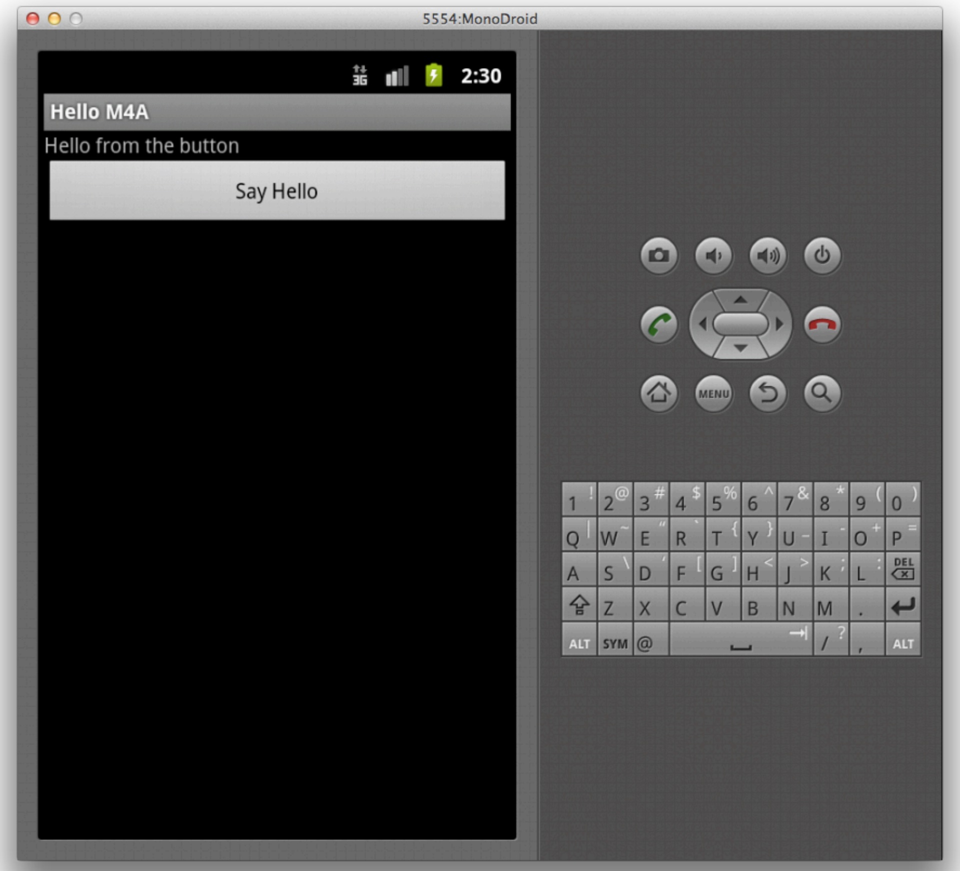
With the controls created and the event handler wired up, we need to add them to the `LinearLayout` instance. `LinearLayout` is a subclass of `ViewGroup`. A ViewGroup is basically a view that contains other views and determines how to display them. The `ViewGroup` class contains an `AddView` method that we can call to add our controls, as we did in this code:

```
layout.AddView (aLabel);
layout.AddView (aButton);
```

The final step in building our app is to add the layout to the screen. We accomplished this by calling the `Activity's SetContentView` method, passing it the layout like this:

```
    SetContentView (layout);
```

If we save our work and run the application, we can click the button and see the text change as shown here:



Creating this code shows how easy and familiar programming applications in Xamarin.Android can be for a .NET developer. However, something unique to Android is how it manages resources. In our simple example, we hard-coded all the strings. Let's change this to use the Android resource system and show you how to make your programming process even simpler and more foolproof.

Creating String Resources

As we just mentioned, Android accesses resources in an unusual way. Android resources are managed under the Resources folder in the **Solution Explorer**. To make them accessible from code, generated `Resource` classes are updated for all resources that are included in the various Resources subfolders.

Let's look at an example where we replace our hard-coded strings with string resources. Under the **Resources > values** folder, open the file named **Strings.xml**. This file includes the application's string resources. Add entries named `helloButtonText` and `helloLabelText` as shown below:

```
<?xml version="1.0" encoding="utf-8"?>
<resources>
    …
    <string name="helloButtonText">Say Hello</string>
    <string name="helloLabelText">Hello Xamarin.Android</string>
</resources>
```

We defined two new string resources in the XML above, one with the name `helloButtonText` and another named `helloLabelText`. Each of these contains a string value. When we include values like these in the Strings.xml file, the generated `Resource` class will update when we rebuild, giving us a mechanism to access the resources from code.

The `Resource` class is in the file Resource.designer.cs. As it is auto-generated, it should never be changed by hand. For the strings we just added, a nested class named `String` will be created in the `Resource` class. The integer fields in this class identify each string, as shown in the following code:

```
public partial class String
{
        …

        // aapt resource value: 0x7f040000
        public const int helloButtonText = 2130968576;

        // aapt resource value: 0x7f040001
        public const int helloLabelText = 2130968577;

        private String()
        {
        }
}
```

To access the strings from code, we call the `SetText` method of the `TextView` and `Button` controls respectively, passing the appropriate resource id. For example, to set the `TextView's` text, replace the line where we set the `aLabel.Text` property with a call to the `SetText` method like this:

```
aLabel.SetText(Resource.String.helloLabelText);
```

Likewise, to set the `Button's` text, we call its `SetText` method:

```
aButton.SetText(Resource.String.helloButtonText);
```

When we run the application, the behavior is the same using either technique, only now we can easily manage the string values without needing to change them in code.

Resources also come into play when we use XML to declare our user interface, as we'll see in the next section.

Creating the User Interface with XML

In addition to creating the user interface in code, Android supports a declarative, XML-based user interface system, similar to technologies such as XAML and HTML. Let's modify our example to create the UI with XML.

Under the **Resources > layout** folder is a file called **Main.axml**. Let's change this file to contain a `LinearLayout` with a `TextView` and a `Button`, just as we've done earlier when we used code to create this application. We can accomplish this by changing **Main.axml** to 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/helloLabel"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="@string/helloLabelText" />
 <Button
        android:id="@+id/aButton"
        android:layout_width="fill_parent"
        android:layout_height="wrap_content"
        android:text="@string/helloButtonText" />
</LinearLayout>
```

If we include XML elements like these for the `LinearLayout`, `TextView`, and `Button` classes, it will cause instances of these to be created at runtime. To access these instances from code, we use their resource ids.

RESOURCE IDS

The syntax `@+id/name` tells the Android parser to generate a resource id for the given element with the supplied name. For example, when we give the `TextView` class an `id` of `@+id/helloLabel`, the `Resource` class will have a nested class `Id` with the integer field `helloLabel`. Similarly, the `Id` class will also contain a field named `aButton`, as shown in the code below:

```
public partial class Id
{

        // aapt resource value: 0x7f050001
        public const int aButton = 2131034113;

        // aapt resource value: 0x7f050000
        public const int helloLabel = 2131034112;

        private Id()
        {
        }
}
```

Also, the syntax `@string/name` allows us to access the string resources that we created earlier in Strings.xml.

Just like the string resources we saw earlier, we can access these controls by using the generated `Resource` class, only this time through the `Id` subclass. Let's switch back over to the **Activity1.cs** file to show how.

In the `OnCreate` method, we now only need code to set the content view and create the event handler, since the `LinearLayout`, `TextView`, and `Button` classes are created from the XML we just defined. Change the `OnCreate` method with the following code:

```
protected override void OnCreate (Bundle bundle)
{
    base.OnCreate (bundle);

    SetContentView(Resource.Layout.Main);

    var aButton = FindViewById<Button> (Resource.Id.aButton);
    var aLabel = FindViewById<TextView> (Resource.Id.helloLabel);

    aButton.Click += (sender, e) => {
        aLabel.Text = "Hello from the button";
    };
}
```

We still needed to call `SetContentView` as we did in our earlier example, only this time we passed the resource id for the layout, `Resource.Layout.Main,` which we defined in Main.axml.

Next, we simply looked up the `Button` and `TextView` instances, respectively, by using the `FindViewById` method and passing the appropriate resource ids. Finally, we set the event handler, as we did earlier in the *Creating the User Interface with Code* section.

When you run the app now, you'll see that it works exactly as it did in the earlier implementation where everything was accomplished in code.

Summary

In this chapter, we examined how to use Xamarin.Android to create and deploy an Android application. We looked at the various parts of an Android application that was created by using the default Xamarin.Android application template. We then walked through how to use only code to create a simple application. Finally, we used Android XML and a declarative user interface definition to create the same application we'd just created in code.