Web Services

Evolve Fundamentals Track, Chapter 9

Xamarin Inc.

Overview

This tutorial introduces how to integrate web service technologies into a Xamarin application. There is no shortage of choices when it comes to what technology to use. Xamarin will work with REST, WCF and SOAP. Because of its simplicity and ubiquity, this tutorial will focus on how to use RESTful services with Xamarin.

REST stands for *Representational State Transfer* and is a style of architecture for distributed systems. It is a stateless, cacheable protocol that was originally designed to work on simple HTTP calls. Many of the major service providers, such as Twitter, Flickr, and Facebook, use REST as the foundation of their public API's. REST is becoming increasingly popular because of their simplicity and platform independence. For example, REST makes it is very easy for a PHP web application running on Linux to communicate with a Java desktop application running on Windows.

The code samples are structured to incrementally add functionality as you progress through the chapter. There are four sample projects included in the solution:

- Android_demo1 – Basic web services using XML and JSON
- Android_demo2 – Async web services
- iOS_demo1 – Basic web services using XML and JSON
- iOS_demo1 – Async web services

The code introduced in this chapter is already present in the samples, but commented out. Use the **Tasks** window in your IDE to quickly find the commented-out code that is marked with a `//TODO:` task identifier.

For more information on using web services in your mobile application, please consult Xamarin's cross-platform Introduction to Web Services.

REST Services

With Xamarin consuming RESTful services is an architecturally simple and performance conscious option. This section examines one technique to interact with REST services from client applications, and introduce the various tools and patterns used to parse the common message formats.

Calling Web Services

The simplicity of RESTful web services has helped make it the primary option for mobile applications, since client interaction requires basic access to HTTP in lieu of a complete SOAP runtime.

`System.Net.WebClient` is one of the most common API's for retrieving data from a RESTful service. The following code snippet shows an example of how to call a web service to download a file from a (fictional) website:

```
var webClient = new WebClient();
var jsonString =
webClient.DownloadString("http://someserver.com/svc/data.json");
```

The DownloadString method (as well as DownloadFile and DownloadData) perform an HTTP GET request, which means you can pass parameters in the query string and also set HTTP Headers, but you cannot send additional data in the request body. REST services typically use other HTTP verbs to perform different actions on the server; some examples are shown below which work against Microsoft's Azure Web Service free-trial demo ToDo app.

HTTP Headers are used to manage authentication and negotiate the data format being used (in this case, JSON). The query string and request body are used to identify the operation being requested, and a specific object id (if available).

POST (Create a new item)

This code snippet will create a new item on the server. The `UploadString` method is used, and the object to be created is serialized as JSON and sent in the request body (`payload`).

```
var AddUrl = "https://" + subdomain + ".azure-mobile.net/tables/TodoItem";
client.Headers.Add (HttpRequestHeader.Accept, "application/json");
client.Headers.Add (HttpRequestHeader.ContentType, "application/json");
client.Headers.Add ("X-ZUMO-APPLICATION", MobileServiceAppId);
var payload = task.ToJson ();
var response = client.UploadString (AddUrl, "POST", payload);
// ...and wait...
var responseString = response;
```

The calling code can query the response body and the HTTP status code to confirm the item was created and determine its identifier (or primary key).

DELETE (Delete an item)

Unlike the POST request, the DELETE request includes the identifier (or primary key) of an object in the query string. This value, along with the DELETE HTTP verb, is how the REST server knows what operation to perform.

```
var DeleteUrl = "https://" + subdomain + ".azure-
mobile.net/tables/TodoItem/{0}"; // includes object identifier
client.Headers.Add(HttpRequestHeader.Accept, "application/json");
client.Headers.Add(HttpRequestHeader.ContentType, "application/json");
client.Headers.Add("X-ZUMO-APPLICATION", MobileServiceAppId);
var payload = task.ToJson();
var response = client.UploadString(String.Format(DeleteUrl, task.Id),
"DELETE", payload);
// ...and wait...
var responseString = response;
```

The calling code can query the response body and the HTTP status code to confirm the delete operation was successful.

PATCH (Update existing item)

As with the DELETE request, the object being updated has its identifier included in the query string. The updated object is serialized as JSON in the request body. The server uses these pieces of information (plus the content type) to parse the request and perform the correct operation.

```
var UpdateUrl = "https://" + subdomain + ".azure-
mobile.net/tables/TodoItem/{0}"; // includes object identifier
WebClient client = new WebClient();
client.Headers.Add (HttpRequestHeader.Accept, "application/json");
client.Headers.Add (HttpRequestHeader.ContentType, "application/json");
client.Headers.Add ("X-ZUMO-APPLICATION", MobileServiceAppId);
var payload = task.ToJson ();
var response = client.UploadString (String.Format (UpdateUrl,task.Id),
"PATCH", payload);
// ...and wait...
var responseString = response;
```

The calling code can query the response body and the HTTP status code to confirm the update succeeded.

Alternatives for Web Services

The above examples using `WebClient` to perform REST operations are perfectly valid, but you can already see there is quite a bit of repetition setting up the HTTP headers and serializing the request body.

Rather than writing this code over and over again, there are a number of components and libraries that provide a higher-level API for accessing web services.

External libraries that you can use to access web services with less code include:

- Parse https://components.xamarin.com/view/parse/
- ServiceStack https://github.com/ServiceStack/ServiceStack
- Azure Mobile Services https://components.xamarin.com/view/azure-mobile-services/
- RestSharp http://restsharp.org/
- Hammock https://github.com/danielcrenna/hammock2
- Amazon Web Services

Blocking

When a web service is called synchronously, it blocks the main thread (also called the UI thread), preventing the user from interacting the application.

In order to prevent this, an application should do as little work in the UI thread as possible. Long running or complex operations should be done in a worker thread. When these operations are finished their results are returned to the UI thread and the user interface updated with the values.

Calling Web Services Asynchronously

Writing safe, multi-threaded code can be hard but the .NET framework provides the *Task Parallel Library (TPL)* make things easier. TPL is a set of APIs that simplify the writing of multi-threaded code, allowing developers to concentrate on the functionality of their application. This section will briefly touch on using the TPL to perform asynchronous operations. The following code demonstrates how to use the TPL to download a file from the Internet and then update the UI thread:

```
private void MethodExecutingOnUIThread()
{
    // This method must be called from the UI thread.
    _progressDialog = ProgressDialog.Show(this, “Downloading”,
        “Please wait while the file downloads…”, true, false);
    Task.Factory.StartNew(() =>
        {
            var webclient = new WebClient();
            webclient.DownloadFile(“URI”, “LocalFile”);
            // Do something with the file here - maybe load it into a
database
        })
        .ContinueWith(task =>
            {
                // Do any updates to the UI here
                _progressDialog.Dismiss();
            }, TaskScheduler.FromCurrentSynchronizationContext());
}
```

`Task.Factory.StartNew` creates and starts a new operation represented by the class Task<TResult>. The code that is inside the lambda expression will be executed asynchronously.

The call to `ContinueWith` creates a *continuation* that will execute once the task is complete. A continuation is a task that will execute after another task completes. The call to `ContinueWith` receives two parameters:

- A lambda with some code to execute.
- An instance of the TaskScheduler class. The `TaskScheduler` class is responsible for queue work onto threads.

Normally the continuation will execute asynchronously, but in this example we provide a `TaskScheduler` that tells the TPL how to queue the work. The call to `TaskSchedule.FromCurrentSynchronizationContext()` retrieves an instance of `System.Threading.SynchronizationContext` that is associated with the UI thread. This ensures that the second lambda that is provided will run on the UI thread, and not in a background thread.

For more in depth information on the Task Parallel Library, consult Microsoft's document.

Note: Only update the user interface from the UI thread. Do not perform any updates the UI from a background thread.

Options for Consuming Web Service Data

After returning the response from an HTTP request, we will be interested in consuming the data in a structured format. This can be accomplished by deserializing the response into defined model objects. Of course, one of the benefits associated with using the Xamarin mobile frameworks is potential re-use of ubiquitous model objects employed throughout the overall application architecture.

The examples in this chapter use both XML and JSON data formats.

XML

.NET has had great support for XML and serialization since version 1.0. Even with complex XML schemas it is possible to use attributes to ensure the XmlSerializer can successfully parse the data with only a few lines of code:

```
XmlSerializer serializerXml = new XmlSerializer(typeof(EventCollection));
object o;
using (System.IO.Stream stream = new FileStream(SessionsXmlFilePath,
FileMode.Open)) {
    o = serializerXml.Deserialize(stream);
    stream.Close();
}
EventCollection events = (EventCollection)o;
```

JSON

Xamarin ships with support for JSON out of the box via classes in the `System.Json` namespace. By using a `System.Json.JsonObject`, results can be retrieved as shown below:

```
var jarray = (JsonArray)JsonValue.Load(fileStream);
var json = jarray[0]; // first one
var speaker = new Speaker();
speaker.Name = json["name"];
speaker.Bio = json["about"];
speaker.Company = json["company"];
```

This is the familiar key-value coding style. However, it’s important to be aware that the `System.Json` tools load the entirety of the data into memory and may not be very efficient for large sets of data.

Alternatives for JSON parsing

In addition to the built-in System.Json parsing support, there are a number of other options:

- Json.NET https://components.xamarin.com/view/json.net/
- ServiceStack.Text https://github.com/ServiceStack/ServiceStack.Text

iOS Web Services

Now that we have an understanding of consuming web services, lets walkthrough updating an application to consume web services. To get this example started, download the zip file `WebServices.zip` and unzip the solution. We must change the application so that it will call a RESTful web service and save the data from that webservice to a file on the device.

The applications are cross-platform and share a common set of Core code. The web service access and parsing will be shared code that we'll access from both iOS and Android samples.

Consuming Web Services

Our application needs to be able to retrieve the conference information from the Internet. We will change our application so that it will retrieve updated conference information from the web, deserialize the data and update our user interface.

1. Lets start by adding some code to call a web service to retrieve some data about the speakers and sessions – we'll use XML for the session data and JSON for the speakers. Uncomment the code in the Core project's `Downloader.cs` file:

```
private void DownloadSessionXml()
{
  var file = SessionsXmlParser.Instance.SessionsXmlFilePath;
  if (File.Exists(file)) {
      File.Delete(file);
  }
  var webclient = new WebClient();
  webclient.DownloadFile(sessionsXmlUrl, file);
}
public static void DownloadSpeakerJson()
{
    var file = SpeakersJsonParser.Instance.SpeakersJsonFilePath;
    if (File.Exists(file)) {
        File.Delete(file);
    }
    var webclient = new WebClient();
    webclient.DownloadFile(speakersJsonUrl, file);
}
```

2. Update `ViewDidLoad` method of `MyTabBarController` that it calls the download methods, as shown in the following code snippet:

```
public override void ViewDidLoad ()
{
    base.ViewDidLoad ();
    Downloader.DownloadSessionXml ();
    Downloader.DownloadSpeakerJson ();
    // rest of the code omitted for berivity...
}
```

Assuming there is an Internet connection, running the application now should cause the XML and JSON files to be downloaded. We still need to parse the data so that it can be displayed in the Sessions and Speakers tabs.

Parsing Sessions XML

3. First examine the XML structure that needs to be parsed. An example of the Evolve schedule is shown here:

```
<?xml version="1.0" encoding="UTF-8"?>
    <events>
        <event>
            <event_key>4</event_key>
            <active>Y</active>
            <title>Training Keynote/Introduction to Mobile
Development</title>
            <event_start>2013-04-14 09:00</event_start>
            <event_end>2013-04-14 10:00</event_end>
            <description>Welcome to Xamarin Evolve Training Days and
Introduction to Mobile Development</description>
            <venue>Dawkins Salon (4th Floor)</venue>
            <speakers>
                <person>
                    <name>Nat Friedman</name>
                    <bio></bio>
                </person>
                <person>
                    <name>Bryan Costanich</name>
                    <bio></bio>
                </person>
            </speakers>
            <tags>Fundamentals</tags>
        </event></events></xml>
```

The SessionXmlDTOs.cs file in the Core project contains class definitions that match this XML structure. Once you have defined the correct class structure, deserializing XML is easy!

```
[Serializable]
public class @event {  // the @ symbol lets you use use keywords as names
    [XmlElement("event_key")]
    public string EventKey {get;set;}
    [XmlElement("title")]
    public string title {get;set;}
    [XmlElement("description")]
    public string description {get;set;}
    [XmlElement("venue")]
    public string venue {get;set;}
    [XmlElement("event_type")]
    public string EventType {get;set;}
    [XmlElement("event_start")]
    public string EventStart {get;set;}
    [XmlElement("event_end")]
    public string EventEnd {get;set;}
    [XmlArray("speakers", IsNullable = true)]
    public person[] speakers {get;set;}
    [XmlElement("tags")]
    public string Tags {get;set;}
}
public class person {
    [XmlElement ("name", IsNullable = true)]
    public string name {get;set;}
}
[System.Xml.Serialization.XmlRootAttribute("events", Namespace = "",
IsNullable = false)]
public class EventCollection
{
    [XmlElement("event")]
    public @event[] @event { get; set; }
}
```

4. Now let's enable the XML parser in the Core project's SessionsXmlParser.cs file. Uncomment the code in the `GetSessions()`. The first part of the method performs the deserialization using the classes defined above:

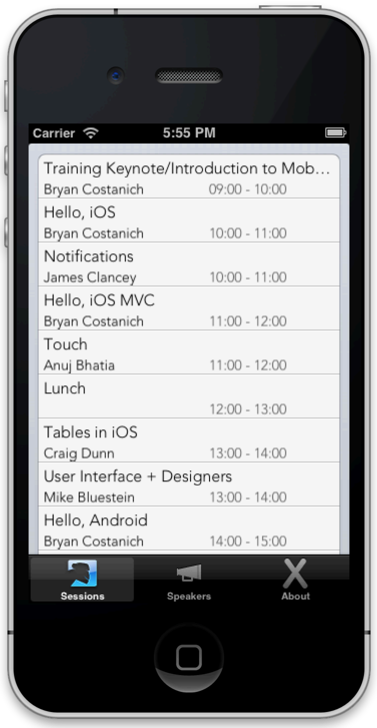
```
XmlSerializer serializerXml = new XmlSerializer(typeof(EventCollection));
object o;
using (System.IO.Stream stream = new
System.IO.FileStream(SessionsXmlFilePath, System.IO.FileMode.Open)) {
    o = serializerXml.Deserialize(stream);
    stream.Close();
}
EventCollection events = (EventCollection)o;
```

5. The second part of the `GetSessions()` method loops through the deserialized objects and copies them into our own `Session` model class. When accessing web services controlled by other parties it's usually a good idea not to rely too heavily on their object model, since they could change it at any time. This also enables us to perform data conversions and validation before using the web service data in the rest of the application.

```
foreach (var evnt in events.@event) {
    var session = new Session() {
        Id = Convert.ToInt32 (evnt.EventKey),
        Title = evnt.title,
        Location = evnt.venue,
        Abstract = evnt.description,
        Begins = DateTime.Parse (evnt.EventStart),
        Ends = DateTime.Parse (evnt.EventEnd),
    };

    if (evnt.speakers != null) { // which happens for LUNCH and TBA
sessions without a Speaker
        foreach (var sp in evnt.speakers) {
            if (!String.IsNullOrWhiteSpace(sp.name))
                session.Speaker = new Speaker() {Name = sp.name};
        }
    }
    localSessions.Add(session);
}
```

If we click on the **Sessions** tab, we will see the data as shown in the following screenshot:


Carrier 5:55 PM

Training Keynote/Introduction to Mob…	
Bryan Costanich	09:00 - 10:00
Hello, iOS	
Bryan Costanich	10:00 - 11:00
Notifications	
James Clancey	10:00 - 11:00
Hello, iOS MVC	
Bryan Costanich	11:00 - 12:00
Touch	
Anuj Bhatia	11:00 - 12:00
Lunch	
	12:00 - 13:00
Tables in iOS	
Craig Dunn	13:00 - 14:00
User Interface + Designers	
Mike Bluestein	13:00 - 14:00
Hello, Android	
Bryan Costanich	14:00 - 15:00

Parsing Speakers JSON

6. To parse the Speakers JSON file, first examine the format:

```
[{"name":"Nat Friedman",
"company":"Xamarin",
"position":"CEO",
"about":"Nat Friedman, Xamarin&rsquo;s co-founder and CEO, has been
writing software for 27 years and is passionate about entrepreneurship and
building amazing products. Nat will cover key mobile trends and
predictions, Xamarin&rsquo;s future direction, and ways for you to
capitalize on mobile - the largest software market ever.",
"url":"@natfriedman",
"avatar":"http://static.sched.org/a2/547192/avatar.jpg.75x75px.jpg"},]
```

The code to parse JSON is in SpeakersJsonParser.cs in the Core project. The first step is to load the JSON file into a JsonArray, which is a key-value collection of the JSON data that we can then further process.

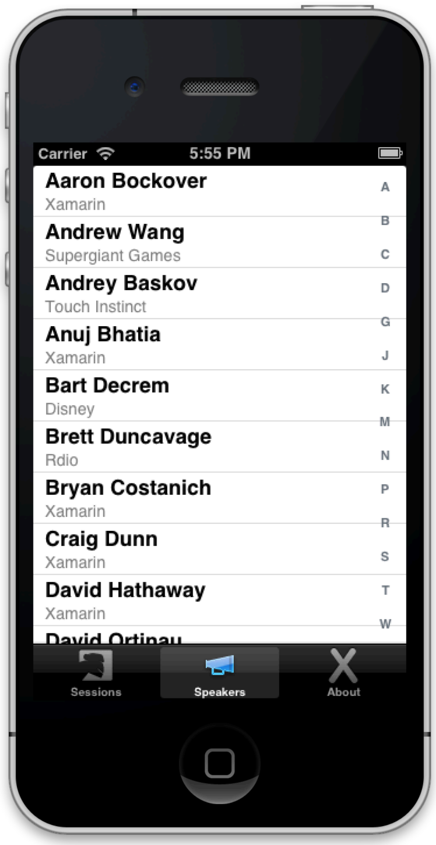
```
using (var r = new StreamReader(File.OpenRead(SpeakersJsonFilePath))) {
    var ja = (JsonArray)JsonValue.Load(r);
    foreach (var speaker in ja) {
        var s = JsonToSpeaker (speaker);
        if (s != null)
            localSpeakers.Add (s);
    }
}
```

The JsonToSpeaker processes each element of the array and returns a Speaker object from our Model class definitions.

```
Speaker JsonToSpeaker(JsonValue json)
{
    Speaker speaker = null;
```

```
        try {
            speaker = new Speaker();
            speaker.Name = json["name"];
            speaker.Bio = json["about"];
            speaker.Company = json["company"];
        } catch {
            // lazy way to deal with missing json elements
        }
        return speaker;
    }
```

The Speakers tab will now look like this. The sample code includes all the code to enable the index that appears on the right of the screen.



Using a Background Thread

This seems to work fine, but there is one problem – if the call to the web service takes a long time, say due to poor internet connection or it is a very large amount of data – our application will appear very unresponsive.

If the main UI thread is unresponsive for too long when the application starts up, iOS will intervene and terminate the application. Apps should ideally be responsive within a few seconds; 10-15 seconds is probably too long!

It's easy Edit `MyTabBarController`'s `ViewDidLoad` to resemble the following code snippet:

```
public override void ViewDidLoad ()
{
    base.ViewDidLoad ();
    Task.Factory.StartNew(() => {
        Downloader.DownloadSessionXml() ;
        Downloader.DownloadSpeakerJson();
    });
    // rest of the code omitted for berivity...
}
```

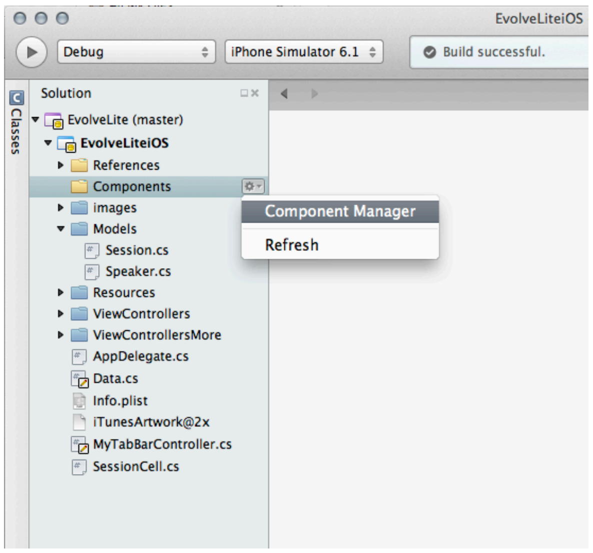
The change that we just made uses the Task Parallel Library to create a task that will run the web service in a background thread. There are two new problems with this:

- The user doesn't know what is happening while the download occurs.
- When it has completed, the Sessions tab is already visible (and empty), and does not get updated with the downloaded data.

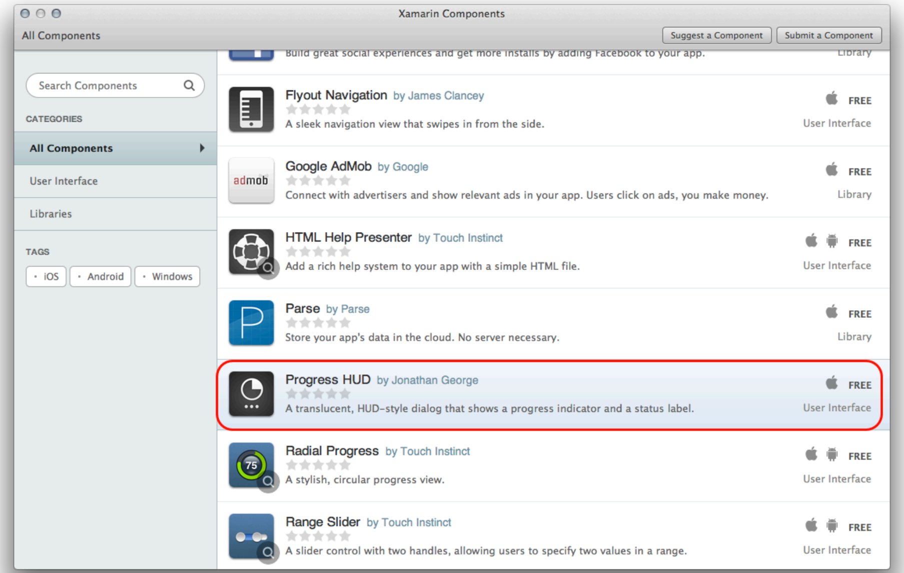
Using the Component Manager

To fix the first issue we'll display some sort of visual indicator that the download is happening. We could code this all by hand, but there is already a 3rd party component, called *Progress HUD*, that will do this for us. Lets walkthrough how to add this component to our application and use it in our application.

1. Start up the Component Manager as shown in the following screen shot:



Scroll down the Xamarin Components dialog until you can see the Progress HUD component as shown in the next screenshot:



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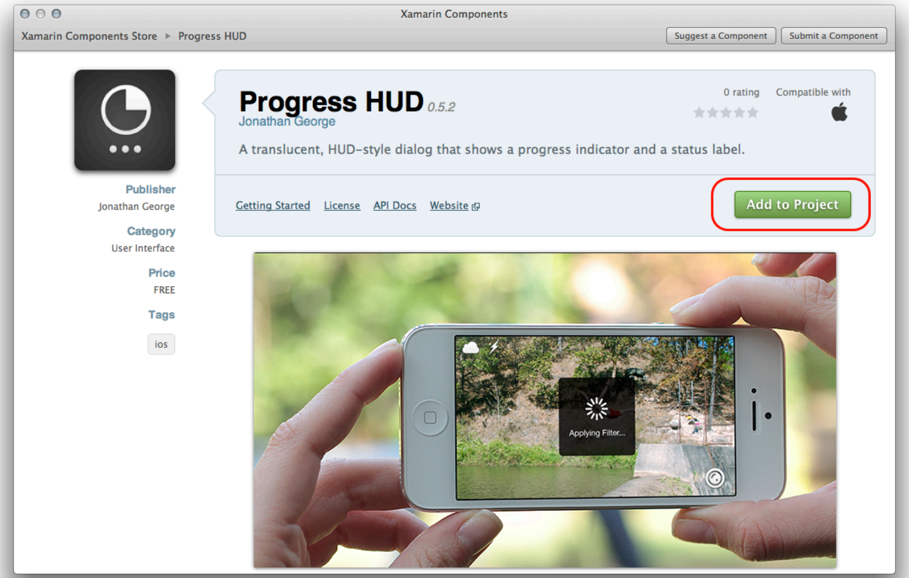
Component	Description	Price	Category
Flyout Navigation by James Clancey	A sleek navigation view that swipes in from the side.	FREE	User Interface
Google AdMob by Google	Connect with advertisers and show relevant ads in your app. Users click on ads, you make money.	FREE	Library
HTML Help Presenter by Touch Instinct	Add a rich help system to your app with a simple HTML file.	FREE	User Interface
Parse by Parse	Store your app's data in the cloud. No server necessary.	FREE	Library
Progress HUD by Jonathan George	A translucent, HUD-style dialog that shows a progress indicator and a status label.	FREE	User Interface
Radial Progress by Touch Instinct	A stylish, circular progress view.	FREE	User Interface
Range Slider by Touch Instinct	A slider control with two handles, allowing users to specify two values in a range.	FREE	User Interface

Click on the row, which will display information page for the Progress HUD and it should look something like the following screenshot:



Xamarin Components

Xamarin Components Store ▸ Progress HUD

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Progress HUD 0.5.2

Jonathan George

0 rating — Compatible with

A translucent, HUD-style dialog that shows a progress indicator and a status label.

Getting Started | License | API Docs | Website

Add to Project

Publisher: Jonathan George

Category: User Interface

Price: FREE

Tags: ios

Click on the Add to Project button. At this point the component has been added to your project.

2. Now lets edit `MyTabBarController` so that it will display a progress dialog while the web service is being called. Add the following instance variable to the class `MyTabBarController`:

```
private  MTMBProgressHUD hud;
```

3. Now update the `ViewDidLoad` method to resemble the following code snippet:

```
public override void ViewDidLoad ()
{
    base.ViewDidLoad ();
    hud = new MTMBProgressHUD(View)
    {
        LabelText = "Updating",
        DetailsLabelText = "Downloading info",
        RemoveFromSuperViewOnHide = true,
        DimBackground = true
    };
    View.AddSubview(hud);
    hud.Show(true);

    Task.Factory.StartNew(() => {
        Downloader.DownloadSessionXml() ;
        Downloader.DownloadSpeakerJson();
    }).ContinueWith(task1 => {
        hud.Hide(true);
        hud = null;
    },
    TaskScheduler.FromCurrentSynchronizationContext ());
    // rest of the code omitted for berivity...
}
```

This code will display a progress indicator in the user interface, and the run `Download` methods in a background thread. Once the download and parsing has finished executing the continuation task will be executed on the UI thread and dismiss the component.

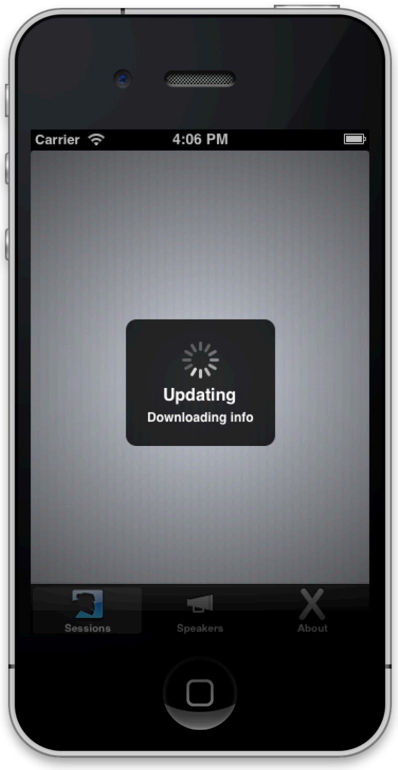
4. If we ran the application now, the Sessions tab would still be empty because it is already being displayed and it has no way to know that new data has been downloaded. To fix this, update the `SessionsViewController ViewDidLoad` method and add a Refresh method, as shown here:

```
public override void ViewDidLoad ()
{
    base.ViewDidLoad ();
    TableView = new UITableView (Rectangle.Empty,
UITableViewStyle.Grouped);
    Refresh ();
}
public void Refresh () {
    TableView.Source = new SessionsTableSource ();
    TableView.ReloadData ();
}
```

5. In MyTabBarController, add a call to the Refresh method once the downloads are complete.

```
Task.Factory.StartNew(() => {
  Downloader.DownloadSessionXml() ;
  Downloader.DownloadSpeakerJson();
}).ContinueWith(task1 => {
  vc1.Refresh();
  hud.Hide(true);
  hud = null;
}, TaskScheduler.FromCurrentSynchronizationContext ());
```

6. Run the application. When the application starts, it will look something like the following screenshot:



Once the download has completed,

Congratulations! At this point you have successfully updated this application to consume a web service in the background.

Android

Now that we have an understanding of consuming web services in iOS, let's apply the same concepts to Xamarin.Android.

Getting Started

To get this example started, download the zip file `WebServices.zip` and unzip the solution.

Some parts of the sample applications are already set up:

- Core project – the XML and JSON downloading and parsing classes are shared with the iOS sample at the start of this chapter. We don't need to change that code at all for our Android samples.
- Activities & Adapters – there are two ListActivities and associated adapters already defined for the Speakers and Sessions tabs.

- Resources/menu/mainactivity_menu.xml – A layout file for an options menu. As a part of this tutorial we will add an options menu so that users may refresh the conference data with the push of a button.
- Resources/values/Strings.xml – This has been updated with some new string resources for the project.

You might want to take a quick minute to familiarize yourself with the changes that have been made.

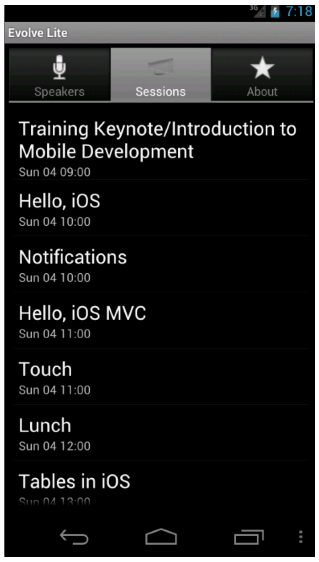
Consuming the Web Service

Our application needs to be able to retrieve the conference information from the Internet. We will change our application so that it will retrieve updated conference information from the web, deserialize the XML and JSON, then update our screens. Because we have already done all the hard work to download and deserialize the data in the iOS example earlier in the chapter, we are going to re-use that code in Android.

1. Review the code in the Downloader.cs file in the Core project. This code was introduced in the iOS section above, and can be shared with Android unchanged.
2. Review the code in the SessionsXmlParser.cs and SpeakersJsonParser.cs files in the Core project. These classes were also introduced in the iOS section above, and can be shared with Android.
3. In the `SessionsActivity` class, uncomment the two lines that cause the XML to be downloaded and parsed, using the Core code that is shared with iOS.

```
protected override void OnCreate(Bundle bundle)
{
    base.OnCreate(bundle);
    Downloader.DownloadSessionXml() ;
    DisplaySessions();
}
private void DisplaySessions()
{
    var sessions = SessionsXmlParser.Instance.Sessions;
    adapter = new SessionsAdapter(this, sessions);
    ListView.Adapter = adapter;
}
```

Because we have already written a `SessionsAdapter` class (in the ListViews chapter), that's all we need to do to display the Session data retrieved from the web service. The Sessions tab looks like this:



Training Keynote/Introduction to Mobile Development
Sun 04 09:00

Hello, iOS
Sun 04 10:00

Notifications
Sun 04 10:00

Hello, iOS MVC
Sun 04 11:00

Touch
Sun 04 11:00

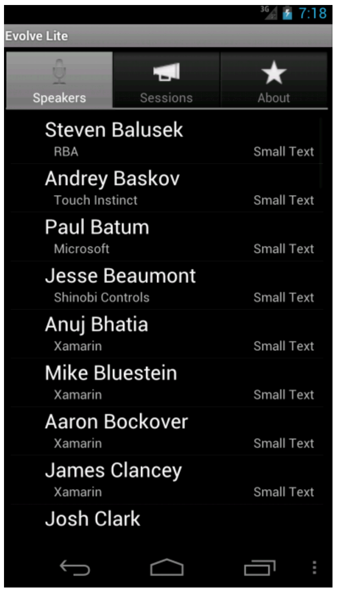
Lunch
Sun 04 12:00

Tables in iOS

4. It is equally simple to re-use the Core code to download and display the Speakers data. In the `SpeakersActivity` class, uncomment the two lines that cause the XML to be downloaded and parsed, using the Core code that is shared with iOS.

```
protected override void OnCreate(Bundle bundle)
{
    base.OnCreate(bundle);
    Downloader.DownloadSpeakerJson();
    DisplaySpeakers();
}
private void DisplaySpeakers()
{
    var speakers = SpeakersJsonParser.Instance.Speakers;
    adapter = new SpeakersAdapter(this, speakers);
    ListView.Adapter = adapter;
}
```

The Speakers tab looks like this when populated with data from the web service:



Steven Balusek
RBA
Small Text
Andrey Baskov
Touch Instinct
Small Text
Paul Batum
Microsoft
Small Text
Jesse Beaumont
Shinobi Controls
Small Text
Anuj Bhatia
Xamarin
Small Text
Mike Bluestein
Xamarin
Small Text
Aaron Bockover
Xamarin
Small Text
James Clancey
Xamarin
Small Text
Josh Clark

Adding a Refresh Menu

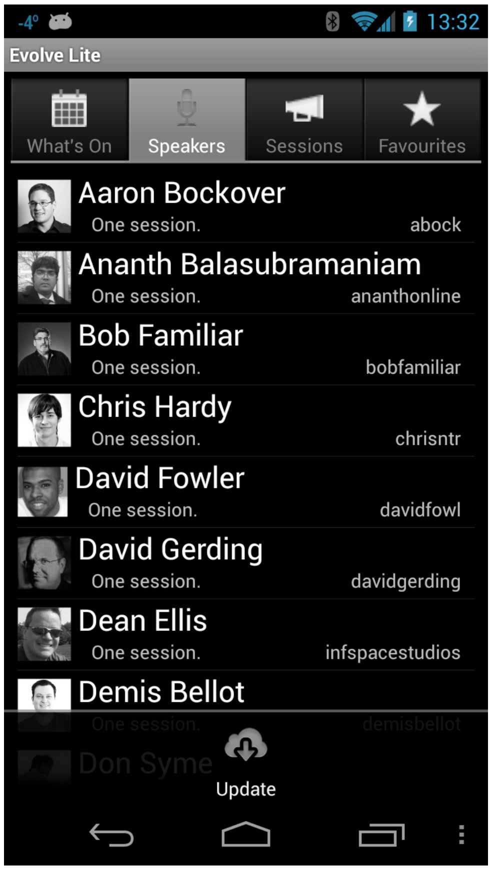
In the step we've just introduced a new concept, so let's take a minute and examine what is going on here. The first method, `OnCreateOptionsMenu`, is invoked by Android during the creation of an Activity. It is a callback that allows an Activity to create or contribute to a menu. In our example we create the menu from an Android menu resource stored at `Resources/menu/mainactivity_menu.xml`. The contents of this file are shown in the following snippet:

```
<?xml version="1.0" encoding="utf-8" ?>
<menu xmlns:android="http://schemas.android.com/apk/res/android">
  <item android:id="@+id/menu_refresh_data"
        android:icon="@drawable/ic_menu_refresh_data"
        android:title="@string/menu_refresh_data"
        />
</menu>
```

This file should seem pretty familiar to you by now. It holds the meta-data that the `MenuInflater` helper will use to add to the options menu for this activity.

The other method that was added to the Activity, `OnOptionsItemSelected`, is called by the system when the user selects a menu item. It takes a `MenuItem` item parameter that is the item that the user selected. The method will compare the ID of the selected menu item with a list of know menu ID's, and performs the appropriate action. `OnOptionsItemSelected` will return `true` for each menu item that it successfully handled. Unknown menu ID's should always be handled by the superclass implementation. For more detailed information about create menus in Android, consult Google's documentation on Menus.

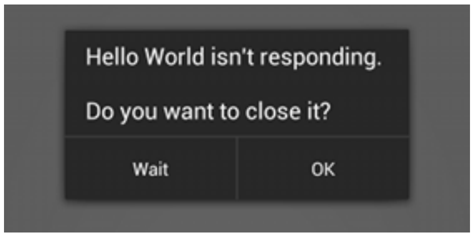
If you run the application and run it, you should be able to see the options menu as show in the following screenshot:



If you select Update, then the application will retrieve updated conference data from the web and update the speaker list. However, all this is happening on the UI thread – which is something our application should avoid doing. Let's move on and address this issue by performing the update on a background thread and by displaying some sort of "in progress" indicator to the user so that they know what is happening.

Using a Background Thread

When a web service is called synchronously, it blocks the main thread (also called the UI thread), preventing the user from interacting the application. If the main UI thread is unresponsive for more than about five seconds, Android will intervene with the dreaded *Application Not Responding (ANR)* dialog, as shown in the following screenshot:



Hello World isn't responding.

Do you want to close it?

In order to prevent this, an application should do as little work in the UI thread as possible. Long running or complex operations should be done in a worker thread.

When these operations are finished their results are returned to the UI thread and the user interface updated with the values.

We can use the same Task.Factory.StartNew method that we did on iOS.

Edit the file `SpeakersActivity.cs` updating the code to use a `ProgressDialog` and `Task.Factory.StartNew`:

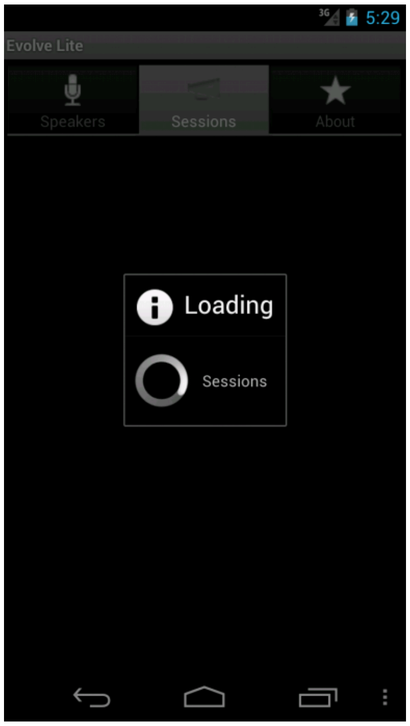
```
SpeakersAdapter adapter;
ProgressDialog progressDialog;
List<Speaker> speakers;

protected override void OnCreate(Bundle bundle)
{
    base.OnCreate(bundle);
    progressDialog = ProgressDialog.Show(this, "Loading", "Speakers", true,
false);
    Task.Factory.StartNew(() => {
        Downloader.DownloadSpeakerJson();
        speakers = SpeakersJsonParser.Instance.Speakers;
    }).ContinueWith(task => {
        DisplaySpeakers();
    }, TaskScheduler.FromCurrentSynchronizationContext());
}
private void DisplaySpeakers()
{
    if (progressDialog != null) {
        progressDialog.Dismiss();
        progressDialog = null;
    }
    adapter = new SpeakersAdapter(this, speakers);
    ListView.Adapter = adapter;
}
```

This method will be used to display a `ProgressDialog` on the Activity while the data is downloaded and parsed on a background thread.

Once the background thread is finished, the continuation that we have setup to run on the UI thread will display the data in the ListView and hide the progress indicator.

Run the application and select the **Speakers** tab. Open up the options menu, and select **Update**. The screen of your application should change to resemble the following screenshot while the data is being updated:



Congratulations! At this point you've got a working application that will refresh itself from a web service and avoid the dreaded ANR that will prompt users to force close your application.

Summary

This tutorial covered various options for consuming web services seamlessly with Xamarin.iOS and Xamarin.Android. It discussed consuming XML and JSON data that was provided by a RESTful web service.

To keep our application responsive, we saw how to perform busy or time-consuming applications in the background using the Task Parallel Library. We also learned how to add a 3rd party component to our application, and to use that component to display a progress dialog to the user while our application is doing something.