

Xamarin .Forms Notes for Professionals

Chapter 3: Xamarin Forms Layouts Section 3.1: AbsoluteLayout

AbsoluteLayout positions and sizes child elements proportional to its own size and position of its parent. Child views may be positioned and sized using proportional values or static values, and proportional values can be mixed.



A definition of an AbsoluteLayout in XAML looks like this:

```
<AbsoluteLayout>
<label text="I'm centered on iPhone 4 but no other device"
AbsoluteLayout.LayoutBounds="113, 156, 100, 100"
AbsoluteLayout.LayoutFlags="PositionProportional" />
</AbsoluteLayout>
```

The same layout would look like this in code:

```
title = "Absolute Layout Example - Code";
var layout = new AbsoluteLayout();
var centerLabel = new Label {
Text = "I'm centered on iPhone 4 but no other device.",
LayoutFlags = LayoutFlags.PositionProportional};
AbsoluteLayout.SetLayoutBounds(layout, new Rectangle(113, 156, 100, 100));
```

Chapter 10: Display Alert

Section 10.1: DisplayAlert

An alert box can be popped up on a Xamarin Forms Page by the method, DisplayAlert. We can provide a Title, Body (text to be alerted) and one or two Action Buttons. Page offers two overloads of DisplayAlert method.

```
1. public Task DisplayAlert (String title, String message, String cancel)
```

This override presents an alert dialog to the application user with a single cancel button. The alert displays modally and once dismissed the user continues interacting with the application.

Example:

```
DisplayAlert ("Alert", "You have been alerted.", "OK");
```

Above snippet will present a native implementation of Alerts in each platform (AlertsDialog in Android, UIAlertView in iOS, MessageBox in Windows) as below.



```
2. public System.Threading.Tasks.Task<bool> DisplayAlert (string title, string message, string accept, string cancel)
```

This override presents an alert dialog to the application user with an accept and a cancel button. It captures response by presenting two buttons and returning a boolean. To get a response from an alert, supply text for buttons and await the method. After the user selects one of the options the answer will be returned to the caller.

Example:

```
var answer = await DisplayAlert ("Question?", "Would you like to play a game?", "Yes", "No");
Debug.WriteLine ("Answer: " + (answer == "Yes" ? "Yes" : "No"));
```

Example 2: If Condition true or false check to alert proceed

Xamarin.Forms Notes for Professionals

Chapter 16: Data Binding Section 16.1: Basic Binding to ViewModel

EntryPage.xaml:

```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://schemas.microsoft.com/winfx/2006/xaml"
xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
x:Class="MyAssembly.EntryPage"
xmlns:viewModel="clr-namespace:MyAssembly.ViewModel;assembly=MyAssembly">
<ContentPage.BindingContext>
</ContentPage.BindingContext>
<ContentPage.Content>
<StackLayout VerticalOptions="FillAndExpand"
HorizontalOptions="FillAndExpand"
Orientation="Vertical"
Spacing="10">
<Label Text="Name:" />
<Entry Text="{Binding Name}" />
<Label Text="{Binding Phone}" />
<Entry Text="{Binding Phone}" />
<Button Text="Save" Command="{Binding SaveCommand}" />
</StackLayout>
</ContentPage.Content>
</ContentPage>
```

MyViewModel.cs:

```
using System;
using System.ComponentModel;
namespace MyAssembly.ViewModel
{
public class MyViewModel : INotifyPropertyChanged
{
private string _name = String.Empty;
private string _phone = String.Empty;
public string Name
{
get { return _name; }
set { _name = value;
if (_name != value)
{
_name = value;
OnPropertyChanged(nameof(Name));
}
}
}
public string Phone
{
get { return _phone; }
set { _phone = value;
if (_phone != value)
{
_phone = value;
OnPropertyChanged(nameof(Phone));
}
}
}
}
```

Xamarin.Forms Notes for Professionals

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About

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Chapter 1: Getting started with Xamarin.Forms

Version	Release Date
3.0.0	2018-05-07
2.5.0	2017-11-15
2.4.0	2017-09-27
2.3.1	2016-08-03
2.3.0-hotfix1	2016-06-29
2.3.0	2016-06-16
2.2.0-hotfix1	2016-05-30
2.2.0	2016-04-27
2.1.0	2016-03-13
2.0.1	2016-01-20
2.0.0	2015-11-17
1.5.1	2016-10-20
1.5.0	2016-09-25
1.4.4	2015-07-27
1.4.3	2015-06-30
1.4.2	2015-04-21
1.4.1	2015-03-30
1.4.0	2015-03-09
1.3.5	2015-03-02
1.3.4	2015-02-17
1.3.3	2015-02-09
1.3.2	2015-02-03
1.3.1	2015-01-04
1.3.0	2014-12-24
1.2.3	2014-10-02
1.2.2	2014-07-30
1.2.1	2014-07-14
1.2.0	2014-07-11
1.1.1	2014-06-19
1.1.0	2014-06-12
1.0.1	2014-06-04

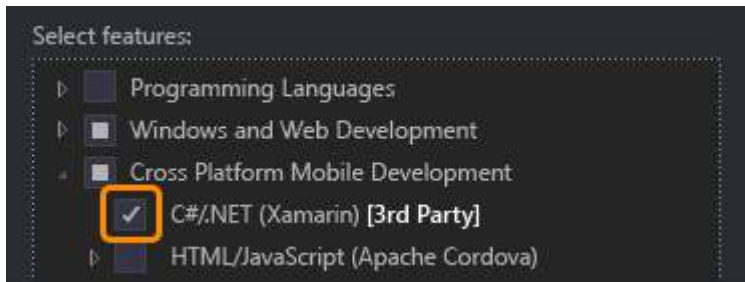
Section 1.1: Installation (Visual Studio)

Xamarin.Forms is a cross-platform natively backed UI toolkit abstraction that allows developers to easily create user interfaces that can be shared across Android, iOS, Windows, and Windows Phone. The user interfaces are rendered using the native controls of the target platform, allowing Xamarin.Forms applications to retain the appropriate look and feel for each platform.

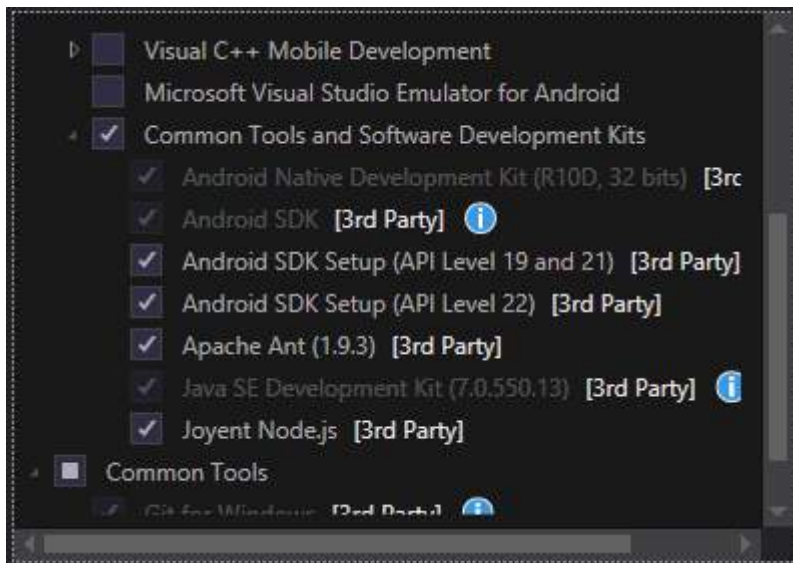
Xamarin Plugin for Visual Studio

To get started with Xamarin.Forms for Visual Studio you need to have the Xamarin plugin itself. The easiest way to have it installed is to download and install the latest Visual Studio.

If you already have the latest Visual Studio installed, go to Control Panel > Programs and Features, right click on Visual Studio, and click Change. When the installer opens, click on Modify, and select the cross-platform mobile development tools:



You can also select to install the Android SDK:



Uncheck it if you already have the SDK installed. You will be able to setup Xamarin to use existing Android SDK later.

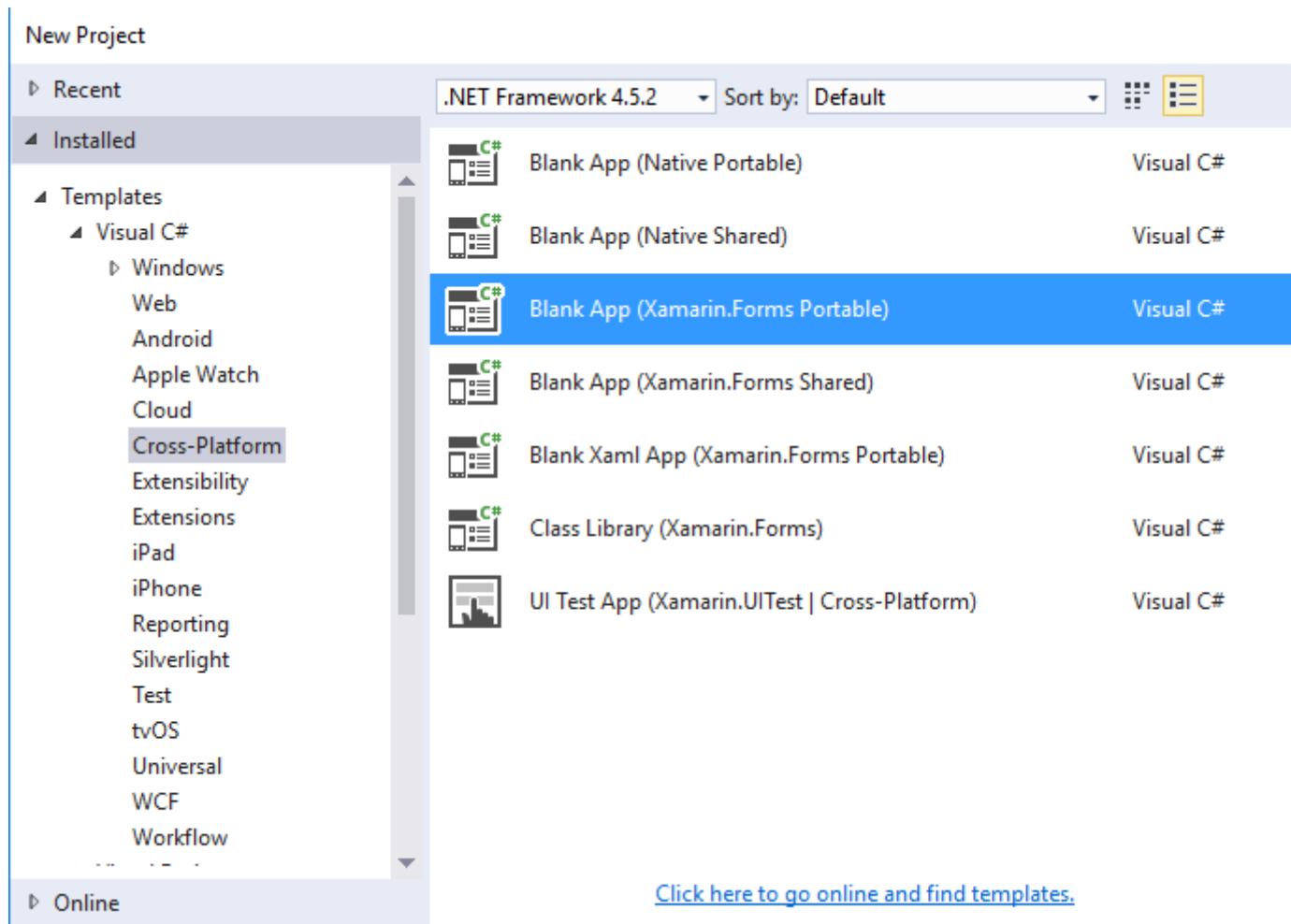
Xamarin.Forms

Xamarin.Forms is a set of libraries for your Portable Class library and native assemblies. The Xamarin.Forms library itself is available as a NuGet package. To add it to your project just use the regular `Install-Package` command of the Package Manager Console:

```
Install-Package Xamarin.Forms
```

for all of your initial assemblies (for example `MyProject`, `MyProject.Droid` and `MyProject.iOS`).

The easiest way to get started with Xamarin.Forms is to create an empty project in Visual Studio:



As you can see there are 2 available options to create the blank app -- Portable and Shared. I recommend you to get started with Portable one because it's the most commonly used in the real world (differences and more explanation to be added).

After creating the project make sure you're using the latest Xamarin.Forms version as your initial template may contain the old one. Use your Package Manager Console or Manage NuGet Packages option to upgrade to the latest Xamarin.Forms (remember it's just a NuGet package).

While the Visual Studio Xamarin.Forms templates will create an iOS platform project for you, you will need to connect Xamarin to a Mac build host to be able to run these projects on the iOS Simulator or physical devices.

Section 1.2: Hello World Xamarin Forms: Visual Studio

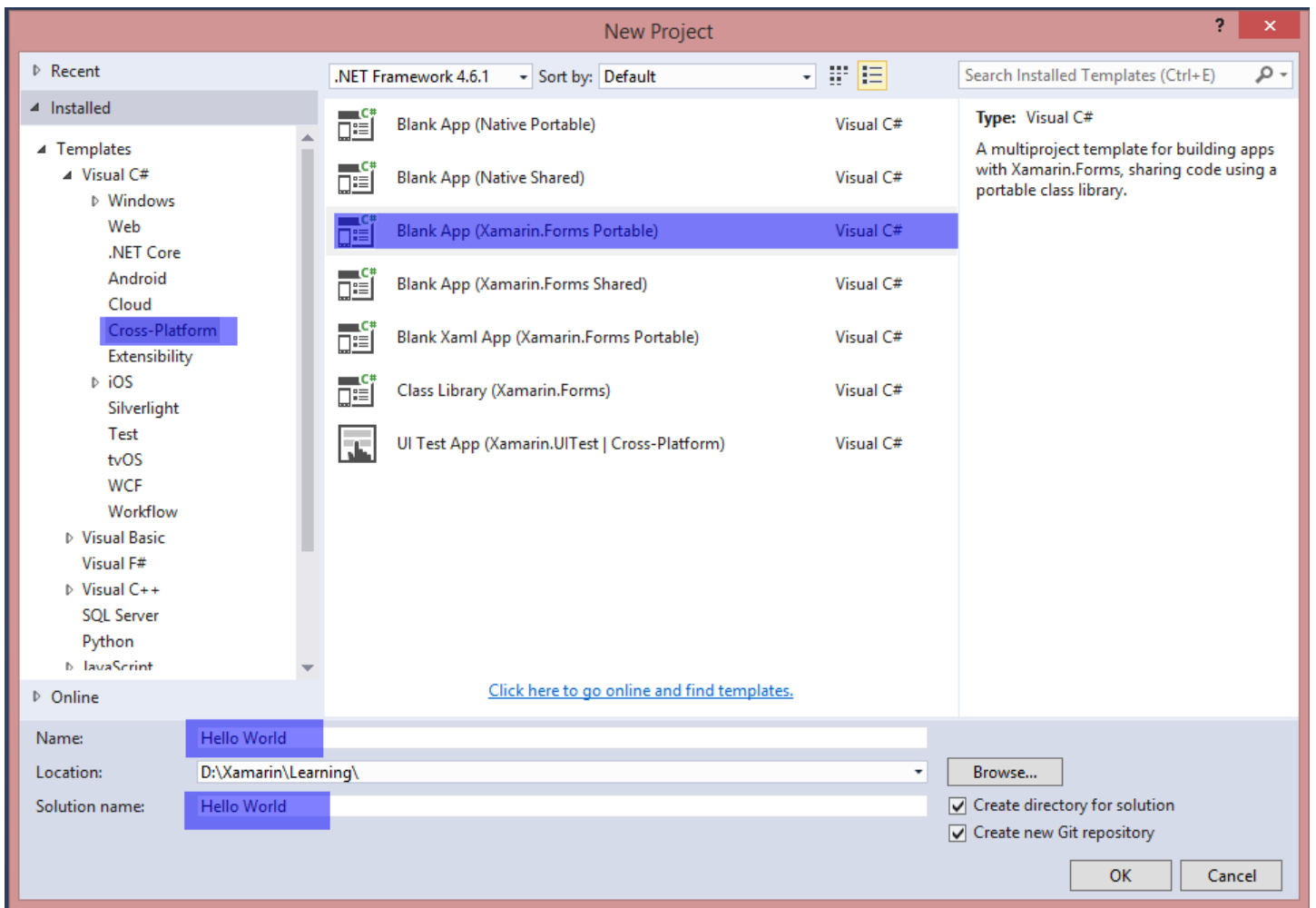
After successfully installing Xamarin as described in the first example, it's time to launch the first sample application.

Step 1: Creating a new Project.

In Visual Studio, choose New -> Project -> Visual C# -> Cross-Platform -> Blank App (Xamarin.Forms Portable)

Name the app "Hello World" and select the location to create the project and click OK. This will create a solution for you which contains three projects:

1. HelloWorld (this is where your logic and views is placed, i.e. the portable project)
2. HelloWorld.Droid (the Android project)
3. HelloWorld.iOS (the iOS project)



Step 2: Investigating the sample

Having created the solution, a sample application will be ready to be deployed. Open the `App.cs` located in the root of the portable project and investigate the code. As seen below, the Contents of the sample is a `StackLayout` which contains a `Label`:

```
using Xamarin.Forms;

namespace Hello_World
{
    public class App : Application
    {
        public App()
        {
            // The root page of your application
            MainPage = new ContentPage
            {
                Content = new StackLayout
                {
                    VerticalOptions = LayoutOptions.Center,
                    Children = {
                        new Label {
                            HorizontalTextAlignment = TextAlignment.Center,
                            Text = "Welcome to Xamarin Forms!"
                        }
                    }
                }
            };
        }
        protected override void OnStart()
    }
}
```

```
{
    // Handle when your app starts
}
protected override void OnSleep()
{
    // Handle when your app sleeps
}
protected override void OnResume()
{
    // Handle when your app resumes
}
}
```

Step 3: Launching the application

Now simply right-click the project you want to start (HelloWorld.Droid or HelloWorld.iOS) and click **Set as StartUp Project**. Then, in the Visual Studio toolbar, click the Start button (the green triangular button that resembles a Play button) to launch the application on the targeted simulator/emulator.

Chapter 2: Why Xamarin Forms and When to use Xamarin Forms

Section 2.1: Why Xamarin Forms and When to use Xamarin Forms

Xamarin is becoming more and more popular - it is hard to decide when to use Xamarin.Forms and when Xamarin.Platform (so Xamarin.iOS and Xamarin.Android).

First of all you should know for what kind of applications you can use Xamarin.Forms:

1. Prototypes - to visualize how your application will look on the different devices.
2. Applications which not require platform specific functionality (like APIs) - but here please note that Xamarin is working busily to provide as many cross-platform compatibility as possible.
3. Applications where code sharing is crucial - more important than UI.
4. Applications where data displayed is more important than advanced functionality

There are also many other factors:

1. Who will be responsible for application development - if your team consists of experienced mobile developers they will be able to handle Xamarin.Forms easily. But if you have one developer per platform (native development) Forms can be bigger challenge.
2. Please also note that with Xamarin.Forms you can still encounter some issues sometimes - Xamarin.Forms platform is still being improved.
3. Fast development is sometimes very important - to reduce costs and time you can decide to use Forms.
4. When developing enterprise applications without any advanced functionality it is better to use Xamarin.Forms - it enables you to share mode code not event in mobile area but in general. Some portions of code can be shared across many platforms.

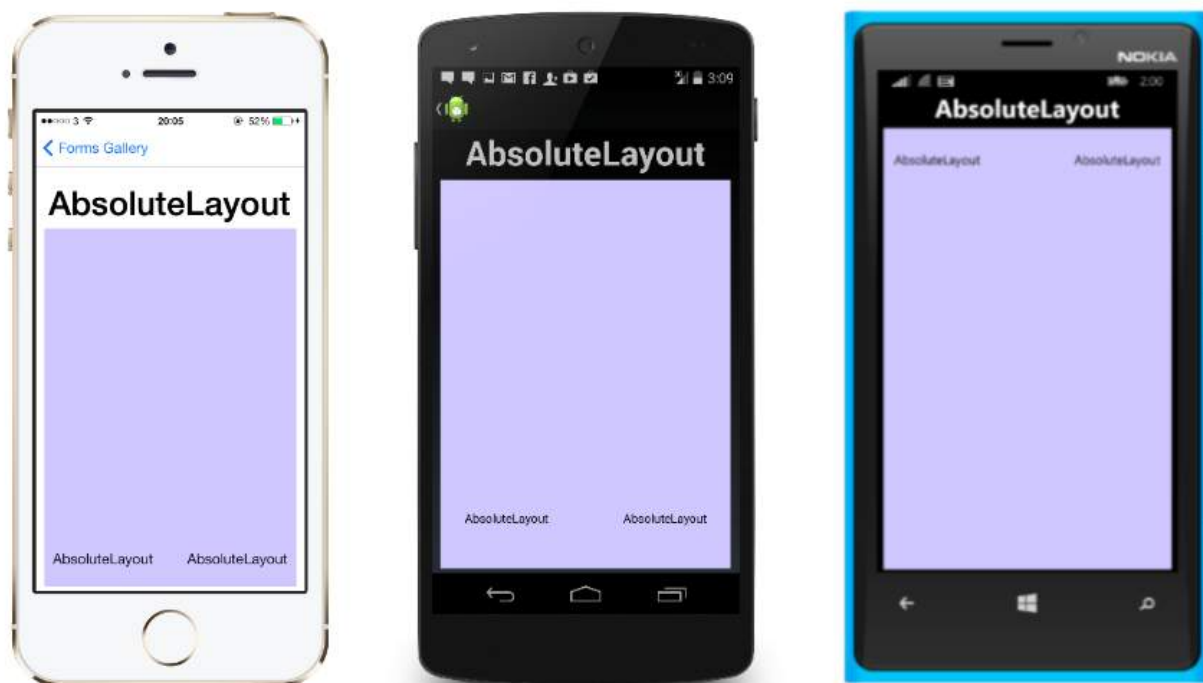
You should not use Xamarin.Forms when:

1. You have to create custom functionality and and access platform specific APIs
2. You have to create custom UI for the mobile application
3. When some functionality is not ready for Xamarin.Forms (like some specific behaviour on the mobile device)
4. Your team consists of platform specific mobile developers (mobile development in Java and/or Swift/Objective C)

Chapter 3: Xamarin Forms Layouts

Section 3.1: AbsoluteLayout

AbsoluteLayout positions and sizes child elements proportional to its own size and position or by absolute values. Child views may be positioned and sized using proportional values or static values, and proportional and static values can be mixed.



A definition of an AbsoluteLayout in XAML looks like this:

```
<AbsoluteLayout>
  <Label Text="I'm centered on iPhone 4 but no other device"
    AbsoluteLayout.LayoutBounds="115,150,100,100" LineBreakMode="WordWrap" />
  <Label Text="I'm bottom center on every device."
    AbsoluteLayout.LayoutBounds=".5,1,.5,.1" AbsoluteLayout.LayoutFlags="All"
    LineBreakMode="WordWrap" />
  <BoxView Color="Olive" AbsoluteLayout.LayoutBounds="1,.5, 25, 100"
    AbsoluteLayout.LayoutFlags="PositionProportional" />
  <BoxView Color="Red" AbsoluteLayout.LayoutBounds="0,.5,25,100"
    AbsoluteLayout.LayoutFlags="PositionProportional" />
  <BoxView Color="Blue" AbsoluteLayout.LayoutBounds=".5,0,100,25"
    AbsoluteLayout.LayoutFlags="PositionProportional" />
  <BoxView Color="Blue" AbsoluteLayout.LayoutBounds=".5,0,1,25"
    AbsoluteLayout.LayoutFlags="PositionProportional, WidthProportional" />
</AbsoluteLayout>
```

The same layout would look like this in code:

```
Title = "Absolute Layout Exploration - Code";
var layout = new AbsoluteLayout();

var centerLabel = new Label {
    Text = "I'm centered on iPhone 4 but no other device.",
    LineBreakMode = LineBreakMode.WordWrap};

AbsoluteLayout.SetLayoutBounds (centerLabel, new Rectangle (115, 159, 100, 100));
```

```
// No need to set layout flags, absolute positioning is the default

var bottomLabel = new Label { Text = "I'm bottom center on every device.", LineBreakMode =
    LineBreakMode.WordWrap };
AbsoluteLayout.SetLayoutBounds (bottomLabel, new Rectangle (.5, 1, .5, .1));
AbsoluteLayout.SetLayoutFlags (bottomLabel, AbsoluteLayoutFlags.All);

var rightBox = new BoxView{ Color = Color.Olive };
AbsoluteLayout.SetLayoutBounds (rightBox, new Rectangle (1, .5, 25, 100));
AbsoluteLayout.SetLayoutFlags (rightBox, AbsoluteLayoutFlags.PositionProportional);

var leftBox = new BoxView{ Color = Color.Red };
AbsoluteLayout.SetLayoutBounds (leftBox, new Rectangle (0, .5, 25, 100));
AbsoluteLayout.SetLayoutFlags (leftBox, AbsoluteLayoutFlags.PositionProportional);

var topBox = new BoxView{ Color = Color.Blue };
AbsoluteLayout.SetLayoutBounds (topBox, new Rectangle (.5, 0, 100, 25));
AbsoluteLayout.SetLayoutFlags (topBox, AbsoluteLayoutFlags.PositionProportional);

var twoFlagsBox = new BoxView{ Color = Color.Blue };
AbsoluteLayout.SetLayoutBounds (topBox, new Rectangle (.5, 0, 1, 25));
AbsoluteLayout.SetLayoutFlags (topBox, AbsoluteLayoutFlags.PositionProportional |
    AbsoluteLayout.WidthProportional);

layout.Children.Add (bottomLabel);
layout.Children.Add (centerLabel);
layout.Children.Add (rightBox);
layout.Children.Add (leftBox);
layout.Children.Add (topBox);
```

The `AbsoluteLayout` control in `Xamarin.Forms` allows you to specify where exactly on the screen you want the child elements to appear, as well as their size and shape (bounds).

There are a few different ways to set the bounds of the child elements based on the `AbsoluteLayoutFlags` enumeration that are used during this process. The **`AbsoluteLayoutFlags`** enumeration contains the following values:

- **All**: All dimensions are proportional.
- **HeightProportional**: Height is proportional to the layout.
- **None**: No interpretation is done.
- **PositionProportional**: Combines `XProportional` and `YProportional`.
- **SizeProportional**: Combines `WidthProportional` and `HeightProportional`.
- **WidthProportional**: Width is proportional to the layout.
- **XProportional**: X property is proportional to the layout.
- **YProportional**: Y property is proportional to the layout.

The process of working with the layout of the `AbsoluteLayout` container may seem a little counterintuitive at first, but with a little use it will become familiar. Once you have created your child elements, to set them at an absolute position within the container you will need to follow three steps. You will want to set the flags assigned to the elements using the **`AbsoluteLayout.SetLayoutFlags()`** method. You will also want to use the **`AbsoluteLayout.SetLayoutBounds()`** method to give the elements their bounds. Finally, you will want to add the child elements to the `Children` collection. Since `Xamarin.Forms` is an abstraction layer between `Xamarin` and the device-specific implementations, the positional values can be independent of the device pixels. This is where the layout flags mentioned previously come into play. You can choose how the layout process of the `Xamarin.Forms` controls should interpret the values you define.

Section 3.2: Grid

A layout containing views arranged in rows and columns.



This is a typical Grid definition in XAML.

```
<Grid>
  <Grid.RowDefinitions>
    <RowDefinition Height="2*" />
    <RowDefinition Height="*" />
    <RowDefinition Height="200" />
  </Grid.RowDefinitions>
  <Grid.ColumnDefinitions>
    <ColumnDefinition Width="Auto" />
    <ColumnDefinition Width="*" />
  </Grid.ColumnDefinitions>

  <ContentView Grid.Row="0" Grid.Column="0" />
  <ContentView Grid.Row="1" Grid.Column="0" />
  <ContentView Grid.Row="2" Grid.Column="0" />

  <ContentView Grid.Row="0" Grid.Column="1" />
  <ContentView Grid.Row="1" Grid.Column="1" />
  <ContentView Grid.Row="2" Grid.Column="1" />
</Grid>
```

The same Grid defined in code looks like this:

```
var grid = new Grid();
grid.RowDefinitions.Add (new RowDefinition { Height = new GridLength(2, GridUnitType.Star) });
grid.RowDefinitions.Add (new RowDefinition { Height = new GridLength(1, GridUnitType.Star) });
grid.RowDefinitions.Add (new RowDefinition { Height = new GridLength(200)});
grid.ColumnDefinitions.Add (new ColumnDefinition{ Width = new GridLength(200) });
```

To add items to the grid: In XAML:

```

<Grid>

  <!--DEFINITIONS...--!>

  <ContentView Grid.Row="0" Grid.Column="0" />
  <ContentView Grid.Row="1" Grid.Column="0" />
  <ContentView Grid.Row="2" Grid.Column="0" />

  <ContentView Grid.Row="0" Grid.Column="1" />
  <ContentView Grid.Row="1" Grid.Column="1" />
  <ContentView Grid.Row="2" Grid.Column="1" />

</Grid>

```

In C# code:

```

var grid = new Grid();
//DEFINITIONS...
var topLeft = new Label { Text = "Top Left" };
var topRight = new Label { Text = "Top Right" };
var bottomLeft = new Label { Text = "Bottom Left" };
var bottomRight = new Label { Text = "Bottom Right" };
grid.Children.Add(topLeft, 0, 0);
grid.Children.Add(topRight, 0, 1);
grid.Children.Add(bottomLeft, 1, 0);
grid.Children.Add(bottomRight, 1, 1);

```

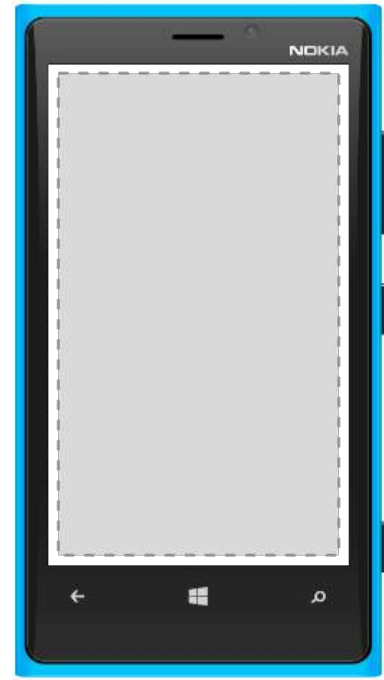
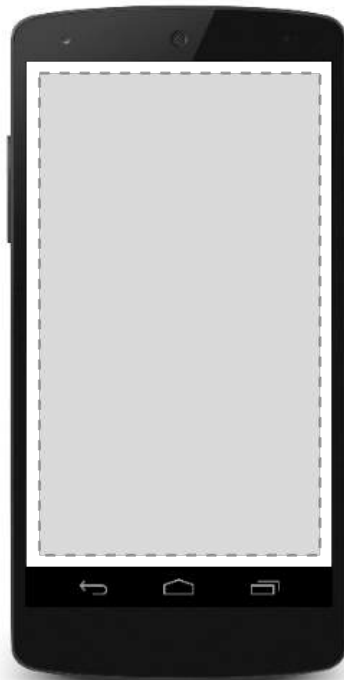
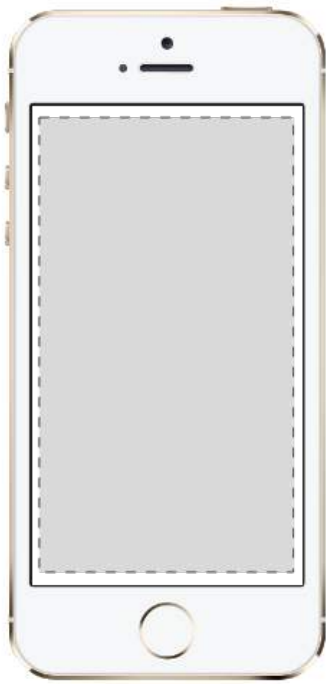
For Height and Width a number of units are available.

- **Auto** – automatically sizes to fit content in the row or column. Specified as `GridUnitType.Auto` in C# or as `Auto` in XAML.
- **Proportional** – sizes columns and rows as a proportion of the remaining space. Specified as a value and `GridUnitType.Star` in C# and as `#*` in XAML, with `#` being your desired value. Specifying one row/column with `*` will cause it to fill the available space.
- **Absolute** – sizes columns and rows with specific, fixed height and width values. Specified as a value and `GridUnitType.Absolute` in C# and as `#` in XAML, with `#` being your desired value.

Note: The width values for columns are set as `Auto` by default in `Xamarin.Forms`, which means that the width is determined from the size of the children. Note that this differs from the implementation of XAML on Microsoft platforms, where the default width is `*`, which will fill the available space.

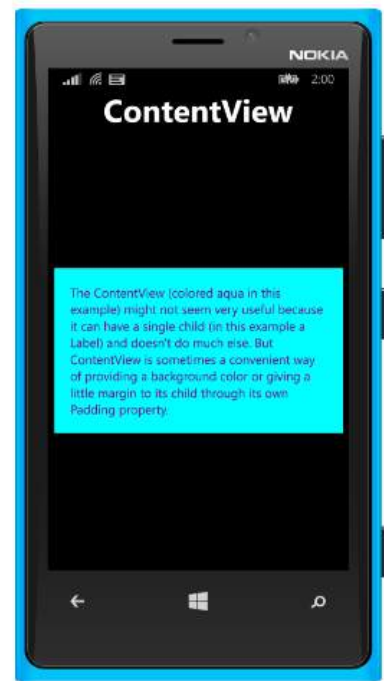
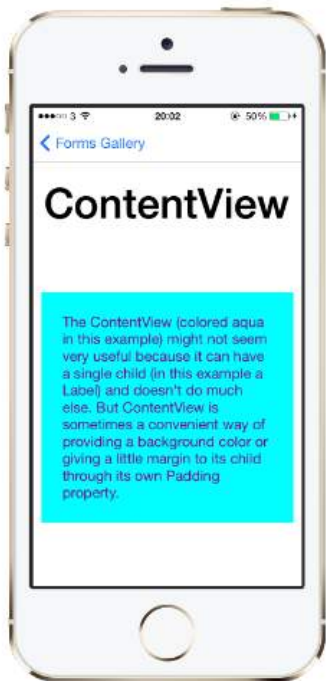
Section 3.3: ContentPresenter

A layout manager for templated views. Used within a `ControlTemplate` to mark where the content to be presented appears.



Section 3.4: ContentView

An element with a single content. ContentView has very little use of its own. Its purpose is to serve as a base class for user-defined compound views.



XAML

```
<ContentView>  
<Label Text="Hi, I'm a simple Label inside of a simple ContentView"  
HorizontalOptions="Center"  
VerticalOptions="Center" />  
</ContentView>
```

Code

```

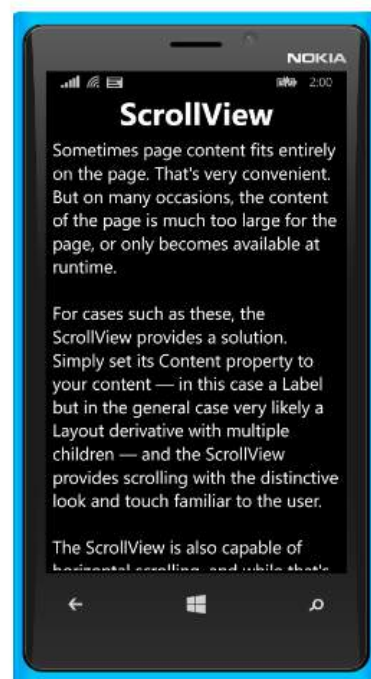
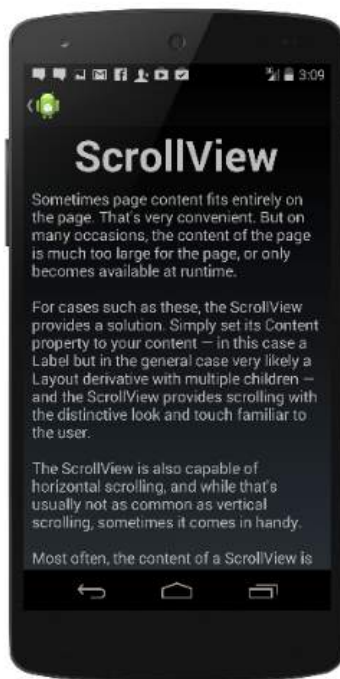
var contentView = new ContentView {
Content = new Label {
Text = "Hi, I'm a simple Label inside of a simple ContentView",
HorizontalOptions = LayoutOptions.Center,
VerticalOptions = LayoutOptions.Center
}
};

```

Section 3.5: ScrollView

An element capable of scrolling if its Content requires.

ScrollView contains layouts and enables them to scroll offscreen. ScrollView is also used to allow views to automatically move to the visible portion of the screen when the keyboard is showing.



Note: ScrollViews should not be nested. In addition, ScrollViews should not be nested with other controls that provide scrolling, like ListView and WebView.

A ScrollView is easy to define. In XAML:

```

<ContentPage.Content>
  <ScrollView>
    <StackLayout>
      <BoxView BackgroundColor="Red" HeightRequest="600" WidthRequest="150" />
      <Entry />
    </StackLayout>
  </ScrollView>
</ContentPage.Content>

```

The same definition in code:

```

var scroll = new ScrollView();
Content = scroll;
var stack = new StackLayout();
stack.Children.Add(new BoxView { BackgroundColor = Color.Red, HeightRequest = 600, WidthRequest = 600 });

```

```
stack.Children.Add(new Entry());
```

Section 3.6: Frame

An element containing a single child, with some framing options. Frame have a default `Xamarin.Forms.Layout.Padding` of 20.



XAML

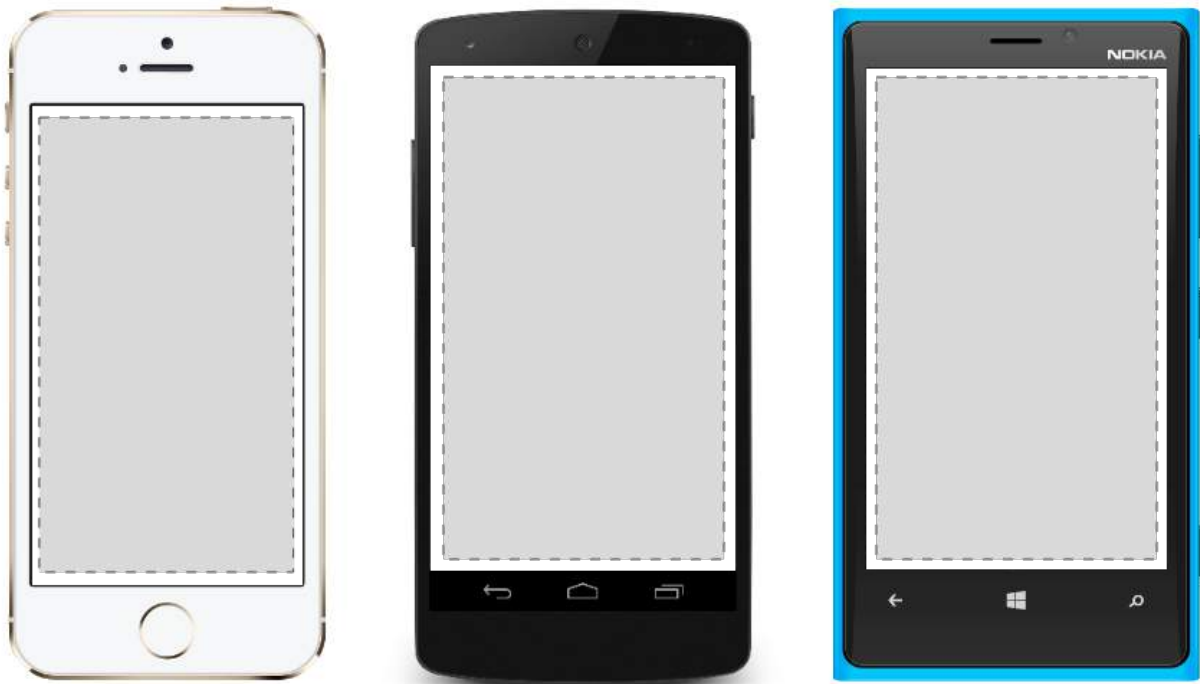
```
<Frame>
<Label Text="I've been framed!"
HorizontalOptions="Center"
VerticalOptions="Center" />
</Frame>
```

Code

```
var frameView = new Frame {
    Content = new Label {
        Text = "I've been framed!",
        HorizontalOptions = LayoutOptions.Center,
        VerticalOptions = LayoutOptions.Center
    },
    OutlineColor = Color.Red
};
```

Section 3.7: TemplatedView

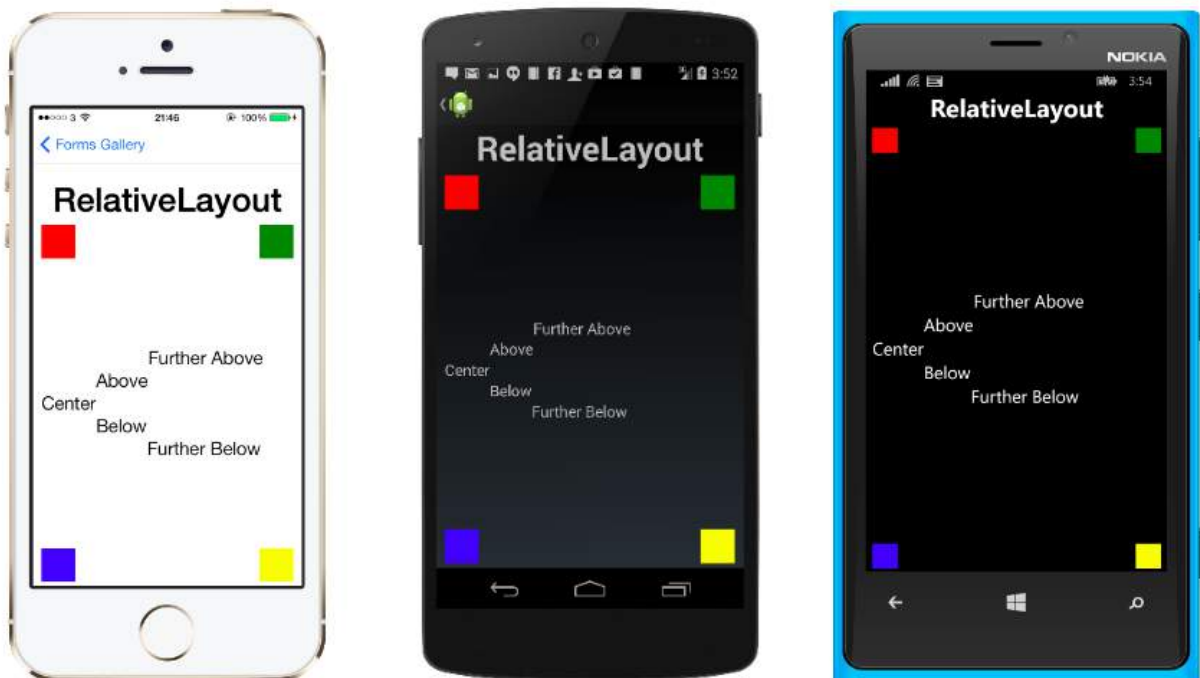
An element that displays content with a control template, and the base class for `ContentView`.



Section 3.8: RelativeLayout

A Layout that uses Constraints to layout its children.

RelativeLayout is used to position and size views relative to properties of the layout or sibling views. Unlike `LinearLayout`, `RelativeLayout` does not have the concept of the moving anchor and does not have facilities for positioning elements relative to the bottom or right edges of the layout. `RelativeLayout` does support positioning elements outside of its own bounds.



A `RelativeLayout` in XAML, is like this:

```
<RelativeLayout>
  <BoxView Color="Red" x:Name="redBox"
    RelativeLayout.YConstraint="{ConstraintExpression Type=RelativeToParent,
      Property=Height, Factor=.15, Constant=0}"
```

```

RelativeLayout.WidthConstraint="{ConstraintExpression
    Type=RelativeToParent,Property=Width,Factor=1,Constant=0}"
RelativeLayout.HeightConstraint="{ConstraintExpression
    Type=RelativeToParent,Property=Height,Factor=.8,Constant=0}" />
<BoxView Color="Blue"
    RelativeLayout.YConstraint="{ConstraintExpression Type=RelativeToView,
        ElementName=redBox,Property=Y,Factor=1,Constant=20}"
    RelativeLayout.XConstraint="{ConstraintExpression Type=RelativeToView,
        ElementName=redBox,Property=X,Factor=1,Constant=20}"
    RelativeLayout.WidthConstraint="{ConstraintExpression
        Type=RelativeToParent,Property=Width,Factor=.5,Constant=0}"
    RelativeLayout.HeightConstraint="{ConstraintExpression
        Type=RelativeToParent,Property=Height,Factor=.5,Constant=0}" />
</RelativeLayout>

```

The same layout can be accomplished with this code:

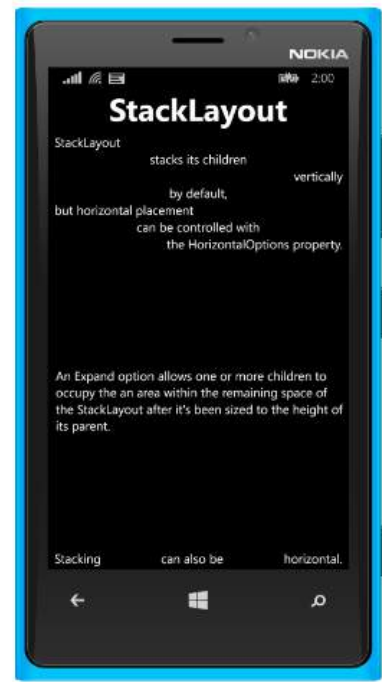
```

layout.Children.Add (redBox, Constraint.RelativeToParent ((parent) => {
    return parent.X;
}), Constraint.RelativeToParent ((parent) => {
    return parent.Y * .15;
}), Constraint.RelativeToParent((parent) => {
    return parent.Width;
}), Constraint.RelativeToParent((parent) => {
    return parent.Height * .8;
}));
layout.Children.Add (blueBox, Constraint.RelativeToView (redBox, (Parent, sibling) => {
    return sibling.X + 20;
}), Constraint.RelativeToView (blueBox, (parent, sibling) => {
    return sibling.Y + 20;
}), Constraint.RelativeToParent((parent) => {
    return parent.Width * .5;
}), Constraint.RelativeToParent((parent) => {
    return parent.Height * .5;
}));

```

Section 3.9: StackLayout

StackLayout organizes views in a one-dimensional line ("stack"), either horizontally or vertically. Views in a StackLayout can be sized based on the space in the layout using layout options. Positioning is determined by the order views were added to the layout and the layout options of the views.



Usage in XAML

```
<StackLayout>
  <Label Text="This will be on top" />
  <Button Text="This will be on the bottom" />
</StackLayout>
```

Usage in code

```
StackLayout stackLayout = new StackLayout
{
    Spacing = 0,
    VerticalOptions = LayoutOptions.FillAndExpand,
    Children =
    {
        new Label
        {
            Text = "StackLayout",
            HorizontalOptions = LayoutOptions.Start
        },
        new Label
        {
            Text = "stacks its children",
            HorizontalOptions = LayoutOptions.Center
        },
        new Label
        {
            Text = "vertically",
            HorizontalOptions = LayoutOptions.End
        },
        new Label
        {
            Text = "by default,",
            HorizontalOptions = LayoutOptions.Center
        },
        new Label
        {
            Text = "but horizontal placement",
            HorizontalOptions = LayoutOptions.Start
        },
        new Label
    }
}
```

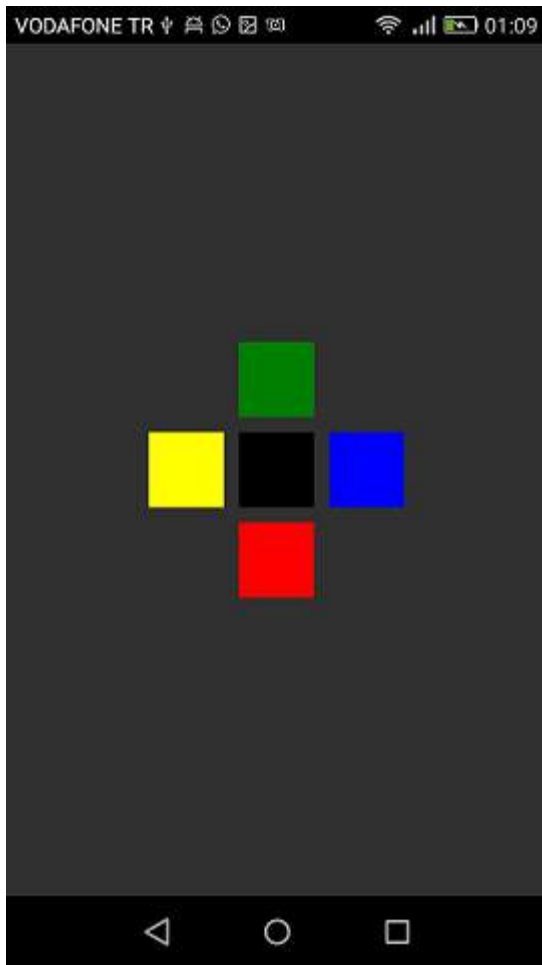
```

{
    Text = "can be controlled with",
    HorizontalOptions = LayoutOptions.Center
},
new Label
{
    Text = "the HorizontalOptions property.",
    HorizontalOptions = LayoutOptions.End
},
new Label
{
    Text = "An Expand option allows one or more children " +
        "to occupy the an area within the remaining " +
        "space of the StackLayout after it's been sized " +
        "to the height of its parent.",
    VerticalOptions = LayoutOptions.CenterAndExpand,
    HorizontalOptions = LayoutOptions.End
},
new StackLayout
{
    Spacing = 0,
    Orientation = StackOrientation.Horizontal,
    Children =
    {
        new Label
        {
            Text = "Stacking",
        },
        new Label
        {
            Text = "can also be",
            HorizontalOptions = LayoutOptions.CenterAndExpand
        },
        new Label
        {
            Text = "horizontal.",
        },
    }
}
};

```

Chapter 4: Xamarin Relative Layout

Section 4.1: Box after box



```
public class MyPage : ContentPage
{
    RelativeLayout _layout;

    BoxView centerBox;
    BoxView rightBox;
    BoxView leftBox;
    BoxView topBox;
    BoxView bottomBox;

    const int spacing = 10;
    const int boxSize = 50;

    public MyPage()
    {
        _layout = new RelativeLayout();

        centerBox = new BoxView
        {
            BackgroundColor = Color.Black
        };

        rightBox = new BoxView
        {
            BackgroundColor = Color.Blue,
            //You can both set width and hight here
        };
    }
}
```



```

        //Or when adding the control to the layout
        WidthRequest = boxSize,
        HeightRequest = boxSize
    };

    leftBox = new BoxView
    {
        BackgroundColor = Color.Yellow,
        WidthRequest = boxSize,
        HeightRequest = boxSize
    };

    topBox = new BoxView
    {
        BackgroundColor = Color.Green,
        WidthRequest = boxSize,
        HeightRequest = boxSize
    };

    bottomBox = new BoxView
    {
        BackgroundColor = Color.Red,
        WidthRequest = boxSize,
        HeightRequest = boxSize
    };

    //First adding center box since other boxes will be relative to center box
    _layout.Children.Add(centerBox,
        //Constraint for X, centering it horizontally
        //We give the expression as a paramater, parent is our layout in this case
        Constraint.RelativeToParent(parent => parent.Width / 2 - boxSize / 2),
        //Constraint for Y, centering it vertically
        Constraint.RelativeToParent(parent => parent.Height / 2 - boxSize / 2),
        //Constraint for Width
        Constraint.Constant(boxSize),
        //Constraint for Height
        Constraint.Constant(boxSize));

    _layout.Children.Add(leftBox,
        //The x constraint will relate on some level to centerBox
        //Which is the first parameter in this case
        //We both need to have parent and centerBox, which will be called sibling,
        //in our expression parameters
        //This expression will be our second paramater
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.X - spacing -
boxSize),
        //Since we only need to move it left,
        //it's Y constraint will be centerBox' position at Y axis
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.Y)
        //No need to define the size constraints
        //Since we initialize them during instantiation
    );

    _layout.Children.Add(rightBox,
        //The only difference hear is adding spacing and boxSize instead of subtracting them
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.X + spacing +
boxSize),
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.Y)
    );

    _layout.Children.Add(topBox,
        //Since we are going to move it vertically this thime

```

```

        //We need to do the math on Y Constraint
        //In this case, X constraint will be centerX' position at X axis
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.X),
        //We will do the math on Y axis this time
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.Y - spacing -
boxSize)
    );

    _layout.Children.Add(bottomBox,
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.X),
        Constraint.RelativeToView(centerBox, (parent, sibling) => sibling.Y + spacing +
boxSize)
    );

    Content = _layout;
}
}

```

Section 4.2: Page with an simple label on the middle



```

public class MyPage : ContentPage
{
    RelativeLayout _layout;
    Label MiddleText;

    public MyPage()
    {
        _layout = new RelativeLayout();

        MiddleText = new Label
        {

```

```
        Text = "Middle Text"
    };

    MiddleText.SizeChanged += (s, e) =>
    {
        //We will force the layout so it will know the actual width and height of the label
        //Otherwise width and height of the label remains 0 as far as layout knows
        _layout.ForceLayout();
    };

    _layout.Children.Add(MiddleText
        Constraint.RelativeToParent(parent => parent.Width / 2 - MiddleText.Width / 2),
        Constraint.RelativeToParent(parent => parent.Height / 2 - MiddleText.Height / 2));

    Content = _layout;
}
}
```

Chapter 5: Navigation in Xamarin.Forms

Section 5.1: NavigationPage flow with XAML

App.xaml.cs file (App.xaml file is default, so skipped)

```
using Xamarin.Forms

namespace NavigationApp
{
    public partial class App : Application
    {
        public static INavigation GlobalNavigation { get; private set; }

        public App()
        {
            InitializeComponent();
            var rootPage = new NavigationPage(new FirstPage());

            GlobalNavigation = rootPage.Navigation;

            MainPage = rootPage;
        }
    }
}
```

FirstPage.xaml file

```
<?xml version="1.0" encoding="UTF-8"?>
<ContentPage
    xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    x:Class="NavigationApp.FirstPage"
    Title="First page">
    <ContentPage.Content>
        <StackLayout>
            <Label
                Text="This is the first page" />
            <Button
                Text="Click to navigate to a new page"
                Clicked="GoToSecondPageButtonClicked"/>
            <Button
                Text="Click to open the new page as modal"
                Clicked="OpenGlobalModalPageButtonClicked"/>
        </StackLayout>
    </ContentPage.Content>
</ContentPage>
```

In some cases you need to open the new page not in the current navigation but in the global one. For example, if your current page contains bottom menu, it will be visible when you push the new page in the current navigation. If you need the page to be opened over the whole visible content hiding the bottom menu and other current page's content, you need to push the new page as a modal into the global navigation. See `App.GlobalNavigation` property and the example below.

FirstPage.xaml.cs file

```
using System;
using Xamarin.Forms;
```

```

namespace NavigationApp
{
    public partial class FirstPage : ContentPage
    {
        public FirstPage()
        {
            InitializeComponent();
        }

        async void GoToSecondPageButtonClicked(object sender, EventArgs e)
        {
            await Navigation.PushAsync(new SecondPage(), true);
        }

        async void OpenGlobalModalPageButtonClicked(object sender, EventArgs e)
        {
            await App.GlobalNavigation.PushModalAsync(new SecondPage(), true);
        }
    }
}

```

SecondPage.xaml file (xaml.cs file is default, so skipped)

```

<?xml version="1.0" encoding="UTF-8"?>
<ContentPage
    xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    x:Class="NavigationApp.SecondPage"
    Title="Second page">
    <ContentPage.Content>
        <Label
            Text="This is the second page" />
    </ContentPage.Content>
</ContentPage>

```

Section 5.2: NavigationPage flow

```

using System;
using Xamarin.Forms;

namespace NavigationApp
{
    public class App : Application
    {
        public App()
        {
            MainPage = new NavigationPage(new FirstPage());
        }
    }

    public class FirstPage : ContentPage
    {
        Label FirstPageLabel { get; set; } = new Label();

        Button FirstPageButton { get; set; } = new Button();

        public FirstPage()
        {
            Title = "First page";
        }
    }
}

```

```

    FirstPageLabel.Text = "This is the first page";
    FirstPageButton.Text = "Navigate to the second page";
    FirstPageButton.Clicked += OnFirstPageButtonClicked;

    var content = new StackLayout();
    content.Children.Add(FirstPageLabel);
    content.Children.Add(FirstPageButton);

    Content = content;
}

async void OnFirstPageButtonClicked(object sender, EventArgs e)
{
    await Navigation.PushAsync(new SecondPage(), true);
}

public class SecondPage : ContentPage
{
    Label SecondPageLabel { get; set; } = new Label();

    public SecondPage()
    {
        Title = "Second page";

        SecondPageLabel.Text = "This is the second page";

        Content = SecondPageLabel;
    }
}
}

```

Section 5.3: Master Detail Navigation

The code below shows how to perform asynchronous navigation when the app is in a MasterDetailPage context.

```

public async Task NavigateMasterDetail(Page page)
{
    if (page == null)
    {
        return;
    }

    var masterDetail = App.Current.MainPage as MasterDetailPage;

    if (masterDetail == null || masterDetail.Detail == null)
        return;

    var navigationPage = masterDetail.Detail as NavigationPage;
    if (navigationPage == null)
    {
        masterDetail.Detail = new NavigationPage(page);
        masterDetail.IsPresented = false;
        return;
    }

    await navigationPage.Navigation.PushAsync(page);
}

```

```

navigationPage.Navigation.RemovePage(navigationPage.Navigation.NavigationStack[navigationPage.Navigation.NavigationStack.Count - 2]);

```

```
        masterDetail.IsPresented = false;
    }
```

Section 5.4: Using INavigation from view model

First step is create navigation interface which we will use on view model:

```
public interface IViewNavigationService
{
    void Initialize(INavigation navigation, SuperMapper navigationMapper);
    Task NavigateToAsync(object navigationSource, object parameter = null);
    Task GoBackAsync();
}
```

In Initialize method I use my custom mapper where I keep collection of pages types with associated keys.

```
public class SuperMapper
{
    private readonly ConcurrentDictionary<Type, object> _typeToAssociateDictionary = new
    ConcurrentDictionary<Type, object>();

    private readonly ConcurrentDictionary<object, Type> _associateToType = new
    ConcurrentDictionary<object, Type>();

    public void AddMapping(Type type, object associatedSource)
    {
        _typeToAssociateDictionary.TryAdd(type, associatedSource);
        _associateToType.TryAdd(associatedSource, type);
    }

    public Type GetTypeSource(object associatedSource)
    {
        Type typeSource;
        _associateToType.TryGetValue(associatedSource, out typeSource);

        return typeSource;
    }

    public object GetAssociatedSource(Type typeSource)
    {
        object associatedSource;
        _typeToAssociateDictionary.TryGetValue(typeSource, out associatedSource);

        return associatedSource;
    }
}
```

Enum with pages:

```
public enum NavigationPageSource
{
    Page1,
    Page2
}
```

App.cs file:

```
public class App : Application
{
```

```

public App()
{
    var startPage = new Page1();
    InitializeNavigation(startPage);
    MainPage = new NavigationPage(startPage);
}

#region Sample of navigation initialization
private void InitializeNavigation(Page startPage)
{
    var mapper = new SuperMapper();
    mapper.AddMapping(typeof(Page1), NavigationPageSource.Page1);
    mapper.AddMapping(typeof(Page2), NavigationPageSource.Page2);

    var navigationService = DependencyService.Get<IViewNavigationService>();
    navigationService.Initialize(startPage.Navigation, mapper);
}
#endregion
}

```

In mapper I associated type of some page with enum value.

IViewNavigationService implementation:

```

[assembly: Dependency(typeof(ViewNavigationService))]
namespace SuperForms.Core.ViewNavigation
{
    public class ViewNavigationService : IViewNavigationService
    {
        private INavigation _navigation;
        private SuperMapper _navigationMapper;

        public void Initialize(INavigation navigation, SuperMapper navigationMapper)
        {
            _navigation = navigation;
            _navigationMapper = navigationMapper;
        }

        public async Task NavigateToAsync(object navigationSource, object parameter = null)
        {
            CheckIsInitialized();

            var type = _navigationMapper.GetTypeSource(navigationSource);

            if (type == null)
            {
                throw new InvalidOperationException(
                    "Can't find associated type for " + navigationSource.ToString());
            }

            ConstructorInfo constructor;
            object[] parameters;

            if (parameter == null)
            {
                constructor = type.GetTypeInfo()
                    .DeclaredConstructors
                    .FirstOrDefault(c => !c.GetParameters().Any());

                parameters = new object[] { };
            }
        }
    }
}

```



```

else
{
    constructor = type.GetTypeInfo()
        .DeclaredConstructors
        .FirstOrDefault(c =>
        {
            var p = c.GetParameters();
            return p.Count() == 1 &&
                p[0].ParameterType == parameter.GetType();
        });

    parameters = new[] { parameter };
}

if (constructor == null)
{
    throw new InvalidOperationException(
        "No suitable constructor found for page " + navigationSource.ToString());
}

var page = constructor.Invoke(parameters) as Page;

await _navigation.PushAsync(page);
}

public async Task GoBackAsync()
{
    CheckIsInitialized();

    await _navigation.PopAsync();
}

private void CheckIsInitialized()
{
    if (_navigation == null || _navigationMapper == null)
        throw new NullReferenceException("Call Initialize method first.");
}
}
}

```

I get type of page on which user want navigate and create it's instance using reflection.

And then I could use navigation service on view model:

```

var navigationService = DependencyService.Get<IViewNavigationService>();
await navigationService.NavigateToAsync(NavigationPageSource.Page2, "hello from Page1");

```

Section 5.5: Master Detail Root Page

```

public class App : Application
{
    internal static NavigationPage NavPage;

    public App ()
    {
        // The root page of your application
        MainPage = new RootPage();
    }
}

public class RootPage : MasterDetailPage

```

```

{
    public RootPage()
    {
        var menuPage = new MenuPage();
        menuPage.Menu.ItemSelected += (sender, e) => NavigateTo(e.SelectedItem as MenuItem);
        Master = menuPage;
        App.NavPage = new NavigationPage(new HomePage());
        Detail = App.NavPage;
    }
    protected override async void OnAppearing()
    {
        base.OnAppearing();
    }
    void NavigateTo(MenuItem menuItem)
    {
        Page displayPage = (Page)Activator.CreateInstance(menuItem.TargetType);
        Detail = new NavigationPage(displayPage);
        IsPresented = false;
    }
}

```

Section 5.6: Hierarchical navigation with XAML

By default, the navigation pattern works like a stack of pages, calling the newest pages over the previous pages. You will need to use the [NavigationPage](#) object for this.

Pushing new pages

```

...
public class App : Application
{
    public App()
    {
        MainPage = new NavigationPage(new Page1());
    }
}
...

```

Page1.xaml

```

...
<ContentPage.Content>
    <StackLayout>
        <Label Text="Page 1" />
        <Button Text="Go to page 2" Clicked="GoToNextPage" />
    </StackLayout>
</ContentPage.Content>
...

```

Page1.xaml.cs

```

...
public partial class Page1 : ContentPage
{
    public Page1()
    {
        InitializeComponent();
    }

    protected async void GoToNextPage(object sender, EventArgs e)
    {
        await Navigation.PushAsync(new Page2());
    }
}

```

...

Page2.xaml

```
...
<ContentPage.Content>
  <StackLayout>
    <Label Text="Page 2" />
    <Button Text="Go to Page 3" Clicked="GoToNextPage" />
  </StackLayout>
</ContentPage.Content>
...
```

Page2.xaml.cs

```
...
public partial class Page2 : ContentPage
{
  public Page2()
  {
    InitializeComponent();
  }

  protected async void GoToNextPage(object sender, EventArgs e)
  {
    await Navigation.PushAsync(new Page3());
  }
}
...
```

Popping pages

Normally the user uses the back button to return pages, but sometimes you need to control this programmatically, so you need to call the method **NavigationPage.PopAsync()** to return to the previous page or **NavigationPage.PopToRootAsync()** to return at the beginning, such like...

Page3.xaml

```
...
<ContentPage.Content>
  <StackLayout>
    <Label Text="Page 3" />
    <Button Text="Go to previous page" Clicked="GoToPreviousPage" />
    <Button Text="Go to beginning" Clicked="GoToStartPage" />
  </StackLayout>
</ContentPage.Content>
...
```

Page3.xaml.cs

```
...
public partial class Page3 : ContentPage
{
  public Page3()
  {
    InitializeComponent();
  }

  protected async void GoToPreviousPage(object sender, EventArgs e)
  {
    await Navigation.PopAsync();
  }

  protected async void GoToStartPage(object sender, EventArgs e)
  {
```

```
        await Navigation.PopToRootAsync();
    }
}
...
```

Section 5.7: Modal navigation with XAML

Modal pages can be created in three ways:

- From **NavigationPage** object for full screen pages
- For Alerts and Notifications
- For ActionSheets that are pop-ups menus

Full screen modals

```
...
// to open
await Navigation.PushModalAsync(new ModalPage());
// to close
await Navigation.PopModalAsync();
...
```

Alerts/Confirmations and Notifications

```
...
// alert
await DisplayAlert("Alert title", "Alert text", "Ok button text");
// confirmation
var booleanAnswer = await DisplayAlert("Confirm?", "Confirmation text", "Yes", "No");
...
```

ActionSheets

```
...
var selectedOption = await DisplayActionSheet("Options", "Cancel", "Destroy", "Option 1", "Option 2", "Option 3");
...
```

Chapter 6: Xamarin.Forms Page

Section 6.1: TabbedPage

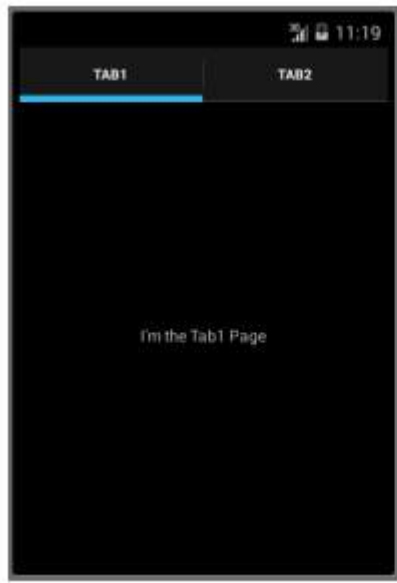
A `TabbedPage` is similar to a `NavigationPage` in that it allows for and manages simple navigation between several child Page objects. The difference is that generally speaking, each platform displays some sort of bar at the top or bottom of the screen that displays most, if not all, of the available child Page objects. In Xamarin.Forms applications, a `TabbedPage` is generally useful when you have a small predefined number of pages that users can navigate between, such as a menu or a simple wizard that can be positioned at the top or bottom of the screen.

XAML

```
<?xml version="1.0" encoding="utf-8" ?>
<TabbedPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             x:Class="XamlBasics.SampleXaml">
  <TabbedPage.Children>
    <ContentPage Title="Tab1">
      <Label Text="I'm the Tab1 Page"
            HorizontalOptions="Center"
            VerticalOptions="Center"/>
    </ContentPage>
    <ContentPage Title="Tab2">
      <Label Text="I'm the Tab2 Page"
            HorizontalOptions="Center"
            VerticalOptions="Center"/>
    </ContentPage>
  </TabbedPage.Children>
</TabbedPage>
```

Code

```
var page1 = new ContentPage {
    Title = "Tab1",
    Content = new Label {
        Text = "I'm the Tab1 Page",
        HorizontalOptions = LayoutOptions.Center,
        VerticalOptions = LayoutOptions.Center
    }
};
var page2 = new ContentPage {
    Title = "Tab2",
    Content = new Label {
        Text = "I'm the Tab2 Page",
        HorizontalOptions = LayoutOptions.Center,
        VerticalOptions = LayoutOptions.Center
    }
};
var tabbedPage = new TabbedPage {
    Children = { page1, page2 }
};
```



Section 6.2: ContentPage

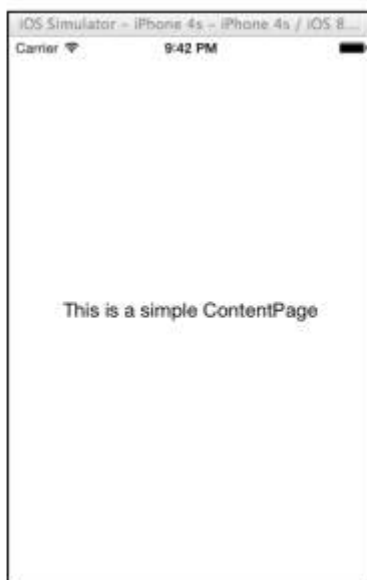
ContentPage: Displays a single View.

XAML

```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
x:Class="XamlBasics.SampleXaml">
<Label Text="This is a simple ContentPage"
HorizontalOptions="Center"
VerticalOptions="Center" />
</ContentPage>
```

Code

```
var label = new Label {
Text = "This is a simple ContentPage",
HorizontalOptions = LayoutOptions.Center,
VerticalOptions = LayoutOptions.Center
};
var contentPage = new ContentPage {
Content = label
};
```



Section 6.3: MasterDetailPage

MasterDetailPage: Manages two separate Pages (panes) of information.

XAML

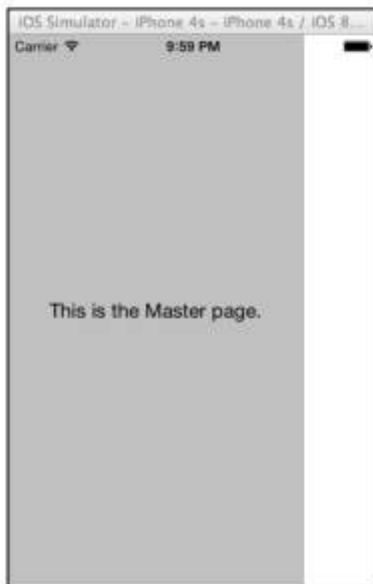
```
<?xml version="1.0" encoding="utf-8" ?>
<MasterDetailPage xmlns="http://xamarin.com/schemas/2014/forms"
xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
x:Class="XamlBasics.SampleXaml">
<MasterDetailPage.Master>
<ContentPage Title = "Master" BackgroundColor = "Silver">
<Label Text="This is the Master page."
TextColor = "Black"
HorizontalOptions="Center"
VerticalOptions="Center" />
</ContentPage>
</MasterDetailPage.Master>
<MasterDetailPage.Detail>
<ContentPage>
<Label Text="This is the Detail page."
HorizontalOptions="Center"
VerticalOptions="Center" />
</ContentPage>
</MasterDetailPage.Detail>
</MasterDetailPage>
```

Code

```
var masterDetailPage = new MasterDetailPage {
Master = new ContentPage {
Content = new Label {
Title = "Master",
BackgroundColor = Color.Silver,

TextColor = Color.Black,
Text = "This is the Master page.",
HorizontalOptions = LayoutOptions.Center,
VerticalOptions = LayoutOptions.Center
}
}
```

```
},
Detail = new ContentPage {
Content = new Label {
Title = "Detail",
Text = "This is the Detail page.",
HorizontalOptions = LayoutOptions.Center,
VerticalOptions = LayoutOptions.Center
}
}
};
```



Chapter 7: Xamarin.Forms Cells

Section 7.1: EntryCell

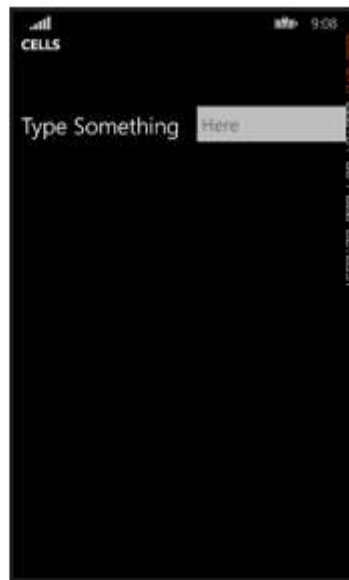
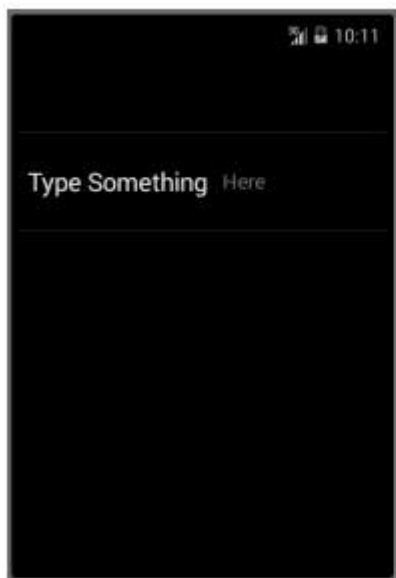
An EntryCell is a Cell that combines the capabilities of a Label and an Entry. The EntryCell can be useful in scenarios when building some functionality within your application to gather data from the user. They can easily be placed into a TableView and be treated as a simple form.

XAML

```
<EntryCell Label="Type Something"  
Placeholder="Here" />
```

Code

```
var entryCell = new EntryCell {  
    Label = "Type Something",  
    Placeholder = "Here"  
};
```



Section 7.2: SwitchCell

A SwitchCell is a Cell that combines the capabilities of a Label and an on-off switch. A SwitchCell can be useful for turning on and off functionality, or even user preferences or configuration options.

XAML

```
<SwitchCell Text="Switch It Up!" />
```

Code

```
var switchCell = new SwitchCell {  
    Text = "Switch It Up!"  
};
```



Section 7.3: TextCell

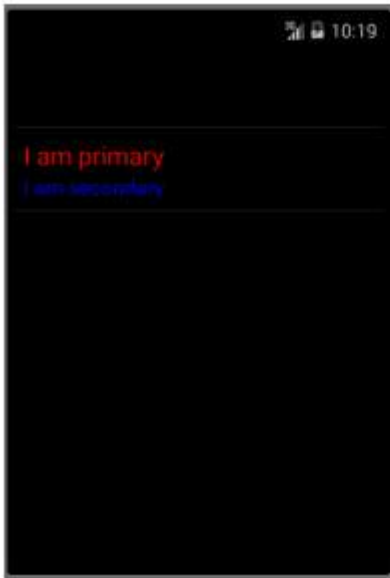
A TextCell is a Cell that has two separate text areas for displaying data. A TextCell is typically used for information purposes in both TableView and ListView controls. The two text areas are aligned vertically to maximize the space within the Cell. This type of Cell is also commonly used to display hierarchical data, so when the user taps this cell, it will navigate to another page.

XAML

```
<TextCell Text="I am primary"
TextColor="Red"
Detail="I am secondary"
DetailColor="Blue"/>
```

Code

```
var textCell = new TextCell {
    Text = "I am primary",
    TextColor = Color.Red,
    Detail = "I am secondary",
    DetailColor = Color.Blue
};
```



Section 7.4: ImageCell

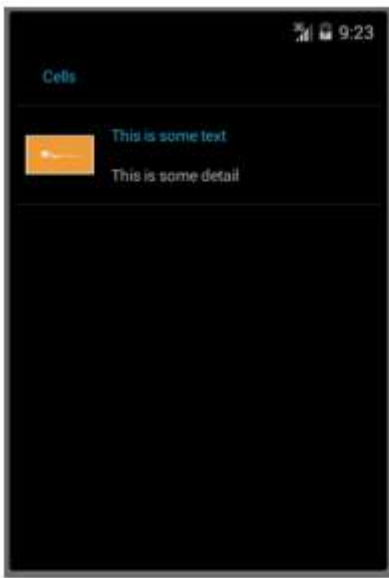
An ImageCell is exactly what it sounds like. It is a simple Cell that contains only an Image. This control functions very similarly to a normal Image control, but with far fewer bells and whistles.

XAML

```
<ImageCell ImageSource="http://d2g29cya9iq7ip.cloudfront.net/content/images/company/aboutus-video-bg.png?v=25072014072745" />  
Text="This is some text"  
Detail="This is some detail" />
```

Code

```
var imageCell = new ImageCell {  
    ImageSource = ImageSource.FromUri(new Uri("http://d2g29cya9iq7ip.cloudfront.net/content/images/company/aboutus-video-bg.png?v=25072014072745")),  
    Text = "This is some text",  
    Detail = "This is some detail"  
};
```



Section 7.5: ViewCell

You can consider a ViewCell a blank slate. It is your personal canvas to create a Cell that looks exactly the way you want it. You can even compose it of instances of multiple other View objects put together with Layout controls. You are only limited by your imagination. And maybe screen size.

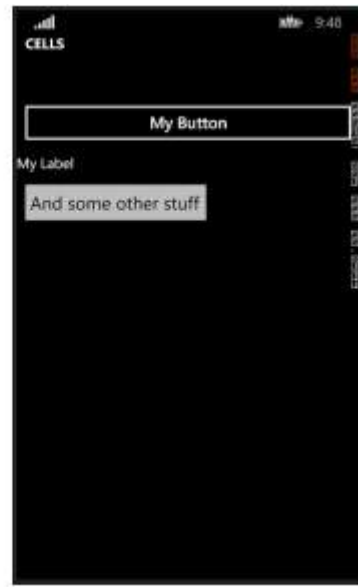
XAML

```
<ViewCell>
<ViewCell.View>
<StackLayout>
<Button Text="My Button" />

<Label Text="My Label" />
<Entry Text="And some other stuff" />
</StackLayout>
</ViewCell.View>
</ViewCell>
```

Code

```
var button = new Button { Text = "My Button" };
var label = new Label { Text = "My Label" };
var entry = new Entry { Text = "And some other stuff" };
var viewCell = new ViewCell {
View = new StackLayout {
Children = { button, label, entry }
}
};
```



Chapter 8: Xamarin.Forms Views

Section 8.1: Button

The **Button** is probably the most common control not only in mobile applications, but in any applications that have a UI. The concept of a button has too many purposes to list here. Generally speaking though, you will use a button to allow users to initiate some sort of action or operation within your application. This operation could include anything from basic navigation within your app, to submitting data to a web service somewhere on the Internet.

XAML

```
<Button
  x:Name="MyButton"
  Text="Click Me!"
  TextColor="Red"
  BorderColor="Blue"
  VerticalOptions="Center"
  HorizontalOptions="Center"
  Clicked="Button_Clicked"/>
```

XAML Code-Behind

```
public void Button_Clicked( object sender, EventArgs args )
{
    MyButton.Text = "I've been clicked!";
}
```

Code

```
var button = new Button( )
{
    Text = "Hello, Forms !",
    VerticalOptions = LayoutOptions.CenterAndExpand,
    HorizontalOptions = LayoutOptions.CenterAndExpand,
    TextColor = Color.Red,
    BorderColor = Color.Blue,
};

button.Clicked += ( sender, args ) =>
{
    var b = (Button) sender;
    b.Text = "I've been clicked!";
};
```



Section 8.2: DatePicker

Quite often within mobile applications, there will be a reason to deal with dates. When working with dates, you will probably need some sort of user input to select a date. This could occur when working with a scheduling or calendar app. In this case, it is best to provide users with a specialized control that allows them to interactively pick a date, rather than requiring users to manually type a date. This is where the DatePicker control is really useful.

XAML

```
<DatePicker Date="09/12/2014" Format="d" />
```

Code

```
var datePicker = new DatePicker{  
    Date = DateTime.Now,  
    Format = "d"  
};
```



Section 8.3: Entry

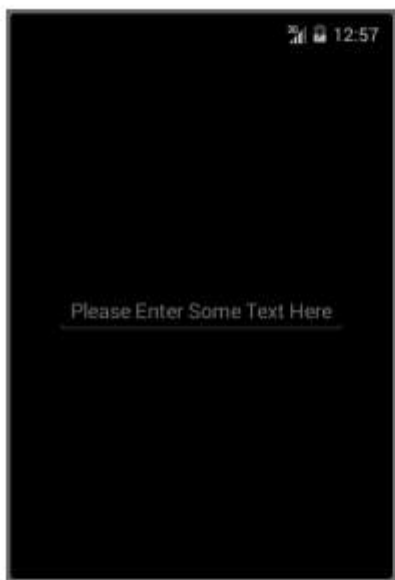
The Entry View is used to allow users to type a single line of text. This single line of text can be used for multiple purposes including entering basic notes, credentials, URLs, and more. This View is a multi-purpose View, meaning that if you need to type regular text or want to obscure a password, it is all done through this single control.

XAML

```
<Entry Placeholder="Please Enter Some Text Here"  
HorizontalOptions="Center"  
VerticalOptions="Center"  
Keyboard="Email"/>
```

Code

```
var entry = new Entry {  
    Placeholder = "Please Enter Some Text Here",  
    HorizontalOptions = LayoutOptions.Center,  
    VerticalOptions = LayoutOptions.Center,  
    Keyboard = Keyboard.Email  
};
```



Section 8.4: Editor

The Editor is very similar to the Entry in that it allows users to enter some free-form text. The difference is that the Editor allows for multi-line input whereas the Entry is only used for single line input. The Entry also provides a few more properties than the Editor to allow further customization of the View.

XAML

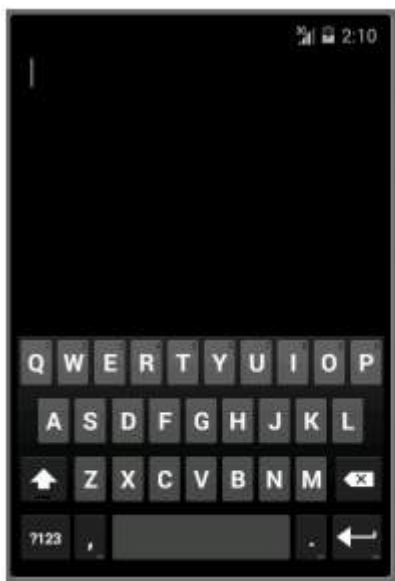
```
<Editor HorizontalOptions="Fill"  
VerticalOptions="Fill"  
Keyboard="Chat"/>
```

Code

```
var editor = new Editor {
```



```
HorizontalOptions = LayoutOptions.Fill,  
VerticalOptions = LayoutOptions.Fill,  
Keyboard = Keyboard.Chat  
};
```



Section 8.5: Image

Images are very important parts of any application. They provide the opportunity to inject additional visual elements as well as branding into your application. Not to mention that images are typically more interesting to look at than text or buttons. You can use an Image as a standalone element within your application, but an Image element can also be added to other View elements such as a Button.

XAML

```
<Image Aspect="AspectFit" Source="http://d2g29cya9iq7ip.cloudfront.net/co  
ntent/images/company/aboutus-video-bg.png?v=25072014072745" />
```

Code

```
var image = new Image {  
    Aspect = Aspect.AspectFit,  
    Source = ImageSource.FromUri(new Uri("http://d2g29cya9iq7ip.cloudfron  
t.net/content/images/company/aboutus-video-bg.png?v=25072014072745"))  
};
```



Section 8.6: Label

Believe it or not, the Label is one of the most crucial yet underappreciated View classes not only in Xamarin.Forms, but in UI development in general. It is seen as a rather boring line of text, but without that line of text it would be very difficult to convey certain ideas to the user. Label controls can be used to describe what the user should enter into an Editor or Entry control. They can describe a section of the UI and give it context. They can be used to show the total in a calculator app. Yes, the Label is truly the most versatile control in your tool bag that may not always spark a lot of attention, but it is the first one noticed if it isn't there.

XAML

```
<Label Text="This is some really awesome text in a Label!"
TextColor="Red"
XAlign="Center"
YAlign="Center"/>
```

Code

```
var label = new Label {
    Text = "This is some really awesome text in a Label!",
    TextColor = Color.Red,
    XAlign = TextAlignment.Center,
    YAlign = TextAlignment.Center
};
```



Chapter 9: Using ListView

This documentation details how to use the different components of the Xamarin Forms ListView

Section 9.1: Pull to Refresh in XAML and Code behind

To enable Pull to Refresh in a ListView in Xamarin, you first need to specify that it is PullToRefresh enabled and then specify the name of the command you want to invoke upon the ListView being pulled:

```
<ListView x:Name="itemListView" IsPullToRefreshEnabled="True" RefreshCommand="Refresh">
```

The same can be achieved in code behind:

```
itemListView.IsPullToRefreshEnabled = true;  
itemListView.RefreshCommand = Refresh;
```

Then, you must specify what the Refresh Command does in your code behind:

```
public ICommand Refresh  
{  
    get  
    {  
        itemListView.IsRefreshing = true; //This turns on the activity  
        //Indicator for the ListView  
        //Then add your code to execute when the ListView is pulled  
        itemListView.IsRefreshing = false;  
    }  
}
```

Chapter 10: Display Alert

Section 10.1: DisplayAlert

An alert box can be popped-up on a `Xamarin.Forms` Page by the method, `DisplayAlert`. We can provide a Title, Body (Text to be alerted) and one/two Action Buttons. Page offers two overrides of `DisplayAlert` method.

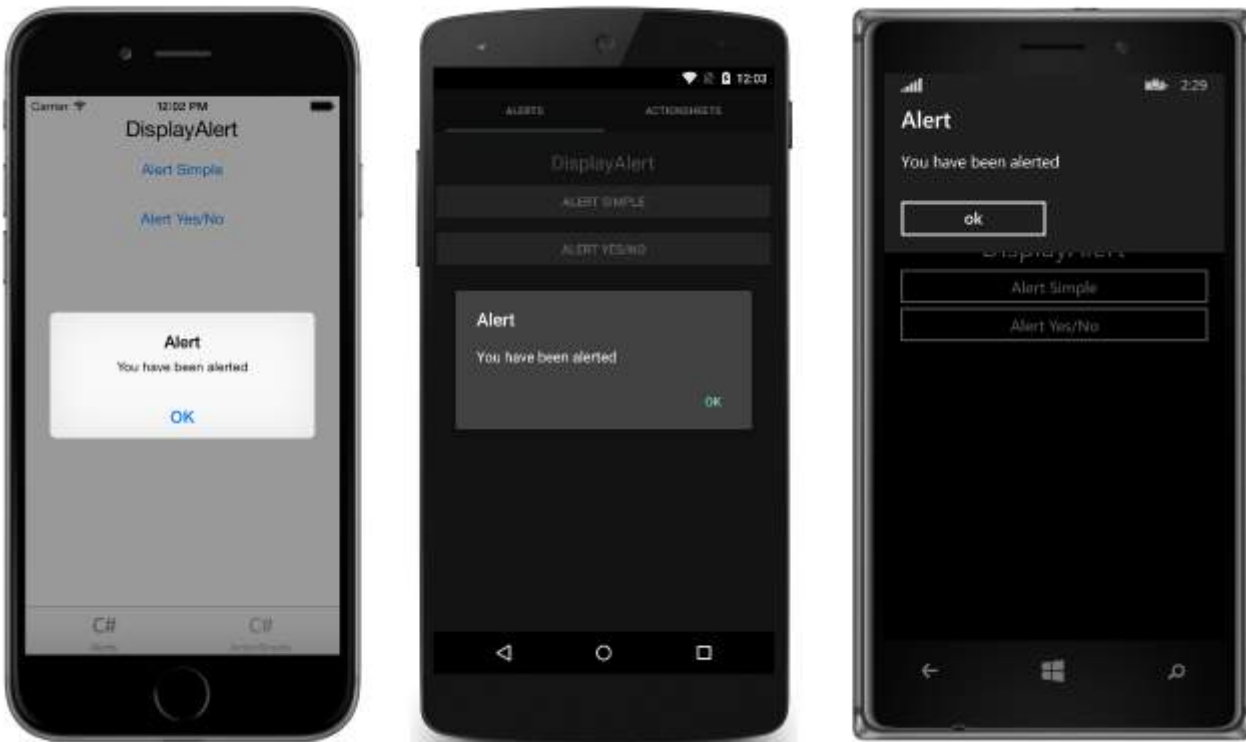
```
1. public Task DisplayAlert (String title, String message, String cancel)
```

This override presents an alert dialog to the application user with a single cancel button. The alert displays modally and once dismissed the user continues interacting with the application.

Example :

```
DisplayAlert ("Alert", "You have been alerted", "OK");
```

Above snippet will present a native implementation of Alerts in each platform (`AlertDialog` in Android, `UIAlertView` in iOS, `MessageDialog` in Windows) as below.



```
2. public System.Threading.Tasks.Task<bool> DisplayAlert (String title, String message, String accept, String cancel)
```

This override presents an alert dialog to the application user with an accept and a cancel button. It captures a user's response by presenting two buttons and returning a `boolean`. To get a response from an alert, supply text for both buttons and await the method. After the user selects one of the options the answer will be returned to the code.

Example :

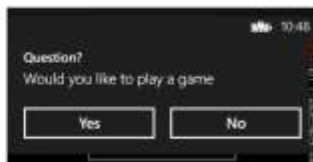
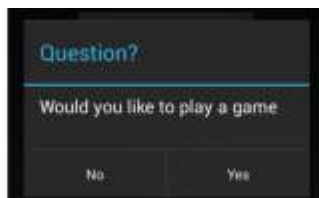
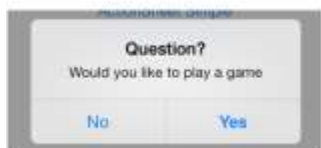
```
var answer = await DisplayAlert ("Question?", "Would you like to play a game", "Yes", "No");  
Debug.WriteLine ("Answer: " + (answer?"Yes":"No"));
```

Example 2:(if Condition true or false check to alert proceed)

```

async void listSelected(object sender, SelectedItemChangedEventArgs e)
{
    var ans = await DisplayAlert("Question?", "Would you like Delete", "Yes", "No");
    if (ans == true)
    {
        //Success condition
    }
    else
    {
        //false conditon
    }
}

```



Section 10.2: Alert Example with only one button and action

```

var alertResult = await DisplayAlert("Alert Title", Alert Message, null, "OK");
if(!alertResult)
{
    //do your stuff.
}

```

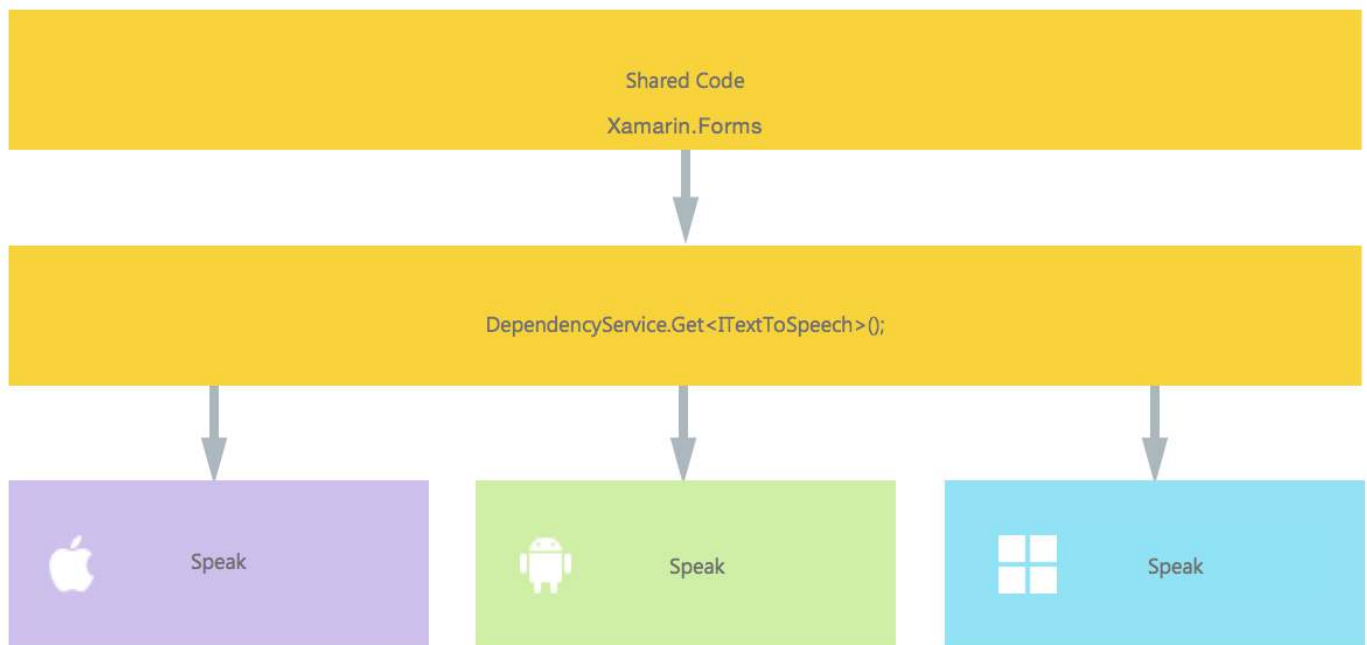
Here we will get Ok click action.

Chapter 11: Accessing native features with DependencyService

Section 11.1: Implementing text-to-speech

A good example of a feature that request platform specific code is when you want to implement text-to-speech (tts). This example assumes that you are working with shared code in a PCL library.

A schematic overview of our solution would look like the image underneath.



In our shared code we define an interface which is registered with the `DependencyService`. This is where we will do our calls upon. Define an interface like underneath.

```
public interface ITextToSpeech
{
    void Speak (string text);
}
```

Now in each specific platform, we need to create an implementation of this interface. Let's start with the iOS implementation.

iOS Implementation

```
using AVFoundation;

public class TextToSpeechImplementation : ITextToSpeech
{
    public TextToSpeechImplementation () {}

    public void Speak (string text)
    {
        var speechSynthesizer = new AVSpeechSynthesizer ();

        var speechUtterance = new AVSpeechUtterance (text) {
            Rate = AVSpeechUtterance.MaximumSpeechRate/4,
            Voice = AVSpeechSynthesisVoice.FromLanguage ("en-US"),
        };
    }
}
```

```

        Volume = 0.5f,
        PitchMultiplier = 1.0f
    };

    speechSynthesizer.SpeakUtterance (speechUtterance);
}
}

```

In the code example above you notice that there is specific code to iOS. Like types such as AVSpeechSynthesizer. These would not work in shared code.

To register this implementation with the Xamarin DependencyService add this attribute above the namespace declaration.

```

using AVFoundation;
using DependencyServiceSample.iOS; //enables registration outside of namespace

[assembly: Xamarin.Forms.Dependency (typeof (TextToSpeechImplementation))]
namespace DependencyServiceSample.iOS {
    public class TextToSpeechImplementation : ITextToSpeech
    //... Rest of code
}

```

Now when you do a call like this in your shared code, the right implementation for the platform you are running your app on is injected.

DependencyService.Get<ITextToSpeech>(). More on this later on.

Android Implementation

The Android implementation of this code would look like underneath.

```

using Android.Speech.Tts;
using Xamarin.Forms;
using System.Collections.Generic;
using DependencyServiceSample.Droid;

public class TextToSpeechImplementation : Java.Lang.Object, ITextToSpeech,
TextToSpeech.IOnInitListener
{
    TextToSpeech speaker;
    string toSpeak;

    public TextToSpeechImplementation () {}

    public void Speak (string text)
    {
        var ctx = Forms.Context; // useful for many Android SDK features
        toSpeak = text;
        if (speaker == null) {
            speaker = new TextToSpeech (ctx, this);
        } else {
            var p = new Dictionary<string, string> ();
            speaker.Speak (toSpeak, QueueMode.Flush, p);
        }
    }

    #region IOnInitListener implementation
    public void OnInit (OperationResult status)
    {
        if (status.Equals (OperationResult.Success)) {

```



```

        var p = new Dictionary<string, string> ();
        speaker.Speak (toSpeak, QueueMode.Flush, p);
    }
}
#endregion
}

```

Again don't forget to register it with the DependencyService.

```

using Android.Speech.Tts;
using Xamarin.Forms;
using System.Collections.Generic;
using DependencyServiceSample.Droid;

[assembly: Xamarin.Forms.Dependency (typeof (TextToSpeechImplementation))]
namespace DependencyServiceSample.Droid{
    //... Rest of code
}

```

Windows Phone Implementation

Finally, for Windows Phone this code can be used.

```

public class TextToSpeechImplementation : ITextToSpeech
{
    public TextToSpeechImplementation() {}

    public async void Speak(string text)
    {
        MediaElement mediaElement = new MediaElement();

        var synth = new Windows.Media.SpeechSynthesis.SpeechSynthesizer();

        SpeechSynthesisStream stream = await synth.SynthesizeTextToStreamAsync("Hello World");

        mediaElement.SetSource(stream, stream.ContentType);
        mediaElement.Play();
        await synth.SynthesizeTextToStreamAsync(text);
    }
}

```

And once more do not forget to register it.

```

using Windows.Media.SpeechSynthesis;
using Windows.UI.Xaml.Controls;
using DependencyServiceSample.WinPhone; //enables registration outside of namespace

[assembly: Xamarin.Forms.Dependency (typeof (TextToSpeechImplementation))]
namespace DependencyServiceSample.WinPhone{
    //... Rest of code
}

```

Implementing in Shared Code

Now everything is in place to make it work! Finally, in your shared code you can now call this function by using the interface. At runtime, the implementation will be injected which corresponds to the current platform it is running on.

In this code you will see a page that could be in a Xamarin Forms project. It creates a button which invokes the `Speak()` method by using the `DependencyService`.

```

public MainPage ()
{
    var speak = new Button {
        Text = "Hello, Forms !",
        VerticalOptions = LayoutOptions.CenterAndExpand,
        HorizontalOptions = LayoutOptions.CenterAndExpand,
    };
    speak.Clicked += (sender, e) => {
        DependencyService.Get<ITextToSpeech>().Speak("Hello from Xamarin Forms");
    };
    Content = speak;
}

```

The result will be that when the app is ran and the button is clicked, the text provided will be spoken.

All of this without having to do hard stuff like compiler hints and such. You now have one uniform way of accessing platform specific functionality through platform independent code.

Section 11.2: Getting Application and Device OS Version Numbers - Android & iOS - PCL

The example below will collect the Device's OS version number and the the version of the application (which is defined in each projects' properties) that is entered into **Version name** on Android and **Version** on iOS.

First make an interface in your PCL project:

```

public interface INativeHelper {
    /// <summary>
    /// On iOS, gets the <c>CFBundleVersion</c> number and on Android, gets the <c>PackageInfo</c>'s
    <c>VersionName</c>, both of which are specified in their respective project properties.
    /// </summary>
    /// <returns><c>string</c>, containing the build number.</returns>
    string GetAppVersion();

    /// <summary>
    /// On iOS, gets the <c>UIDevice.CurrentDevice.SystemVersion</c> number and on Android, gets the
    <c>Build.VERSION.Release</c>.
    /// </summary>
    /// <returns><c>string</c>, containing the OS version number.</returns>
    string GetOsVersion();
}

```

Now we implement the interface in the Android and iOS projects.

Android:

```

[assembly: Dependency(typeof(NativeHelper_Android))]

namespace YourNamespace.Droid{
    public class NativeHelper_Android : INativeHelper {

        /// <summary>
        /// See interface summary.
        /// </summary>
        public string GetAppVersion() {
            Context context = Forms.Context;
            return context.PackageManager.GetPackageInfo(context.PackageName, 0).VersionName;
        }
    }
}

```

```

    /// <summary>
    /// See interface summary.
    /// </summary>
    public string GetOsVersion() { return Build.VERSION.Release; }
}

```

iOS:

```

[assembly: Dependency(typeof(NativeHelper_iOS))]

namespace YourNamespace.iOS {
    public class NativeHelper_iOS : INativeHelper {

        /// <summary>
        /// See interface summary.
        /// </summary>
        public string GetAppVersion() { return Foundation.NSBundle.MainBundle.InfoDictionary[new
Foundation.NSString("CFBundleVersion")].ToString(); }

        /// <summary>
        /// See interface summary.
        /// </summary>
        public string GetOsVersion() { return UIDevice.CurrentDevice.SystemVersion; }
    }
}

```

Now to use the code in a method:

```

public string GetOsAndAppVersion {
    INativeHelper helper = DependencyService.Get<INativeHelper>();

    if(helper != null) {
        string osVersion = helper.GetOsVersion();
        string appVersion = helper.GetBuildNumber()
    }
}

```

Chapter 12: DependencyService

Section 12.1: Android implementation

The Android specific implementation is a bit more complex because it forces you to inherit from a native `Java.Lang.Object` and forces you to implement the `IOnInitListener` interface. Android requires you to provide a valid Android context for a lot of the SDK methods it exposes. `Xamarin.Forms` exposes a `Forms.Context` object that provides you with a Android context that you can use in such cases.

```
using Android.Speech.Tts;
using Xamarin.Forms;
using System.Collections.Generic;
using DependencyServiceSample.Droid;

public class TextToSpeechAndroid : Java.Lang.Object, ITextToSpeech, TextToSpeech.IOnInitListener
{
    TextToSpeech _speaker;

    public TextToSpeechAndroid () {}

    public void Speak (string whatToSay)
    {
        var ctx= Forms.Context;

        if (_speaker == null)
        {
            _speaker = new TextToSpeech (ctx, this);
        }
        else
        {
            var p = new Dictionary<string,string> ();
            _speaker.Speak (whatToSay, QueueMode.Flush, p);
        }
    }

    #region IOnInitListener implementation

    public void OnInit (OperationResult status)
    {
        if (status.Equals (OperationResult.Success))
        {
            var p = new Dictionary<string,string> ();
            _speaker.Speak (toSpeak, QueueMode.Flush, p);
        }
    }

    #endregion
}
```

When you've created your class you need to enable the `DependencyService` to discover it at run time. This is done by adding an `[assembly]` attribute above the class definition and outside of any namespace definitions.

```
using Android.Speech.Tts;
using Xamarin.Forms;
using System.Collections.Generic;
using DependencyServiceSample.Droid;
```

```
[assembly: Xamarin.Forms.Dependency (typeof (TextToSpeechAndroid))]
namespace DependencyServiceSample.Droid {
    ...
}
```

This attribute registers the class with the `DependencyService` so it can be used when an instance of the `ITextToSpeech` interface is needed.

Section 12.2: Interface

The interface defines the behaviour that you want to expose through the `DependencyService`. One example usage of a `DependencyService` is a Text-To-Speech service. There is currently no abstraction for this feature in `Xamarin.Forms`, so you need to create your own. Start off by defining an interface for the behaviour:

```
public interface ITextToSpeech
{
    void Speak (string whatToSay);
}
```

Because we define our interface we can code against it from our shared code.

Note: Classes that implement the interface need to have a parameterless constructor to work with the `DependencyService`.

Section 12.3: iOS implementation

The interface you defined needs to be implemented in every targeted platform. For iOS this is done through the `AVFoundation` framework. The following implementation of the `ITextToSpeech` interface handles speaking a given text in English.

```
using AVFoundation;

public class TextToSpeechiOS : ITextToSpeech
{
    public TextToSpeechiOS () {}

    public void Speak (string whatToSay)
    {
        var speechSynthesizer = new AVSpeechSynthesizer ();

        var speechUtterance = new AVSpeechUtterance (whatToSay) {
            Rate = AVSpeechUtterance.MaximumSpeechRate/4,
            Voice = AVSpeechSynthesisVoice.FromLanguage ("en-US"),
            Volume = 0.5f,
            PitchMultiplier = 1.0f
        };

        speechSynthesizer.SpeakUtterance (speechUtterance);
    }
}
```

When you've created your class you need to enable the `DependencyService` to discover it at run time. This is done by adding an `[assembly]` attribute above the class definition and outside of any namespace definitions.

```
using AVFoundation;
using DependencyServiceSample.iOS;

[assembly: Xamarin.Forms.Dependency (typeof (TextToSpeechiOS))]
```

```
namespace DependencyServiceSample.iOS {
    public class TextToSpeechiOS : ITextToSpeech
    ...
}
```

This attribute registers the class with the `DependencyService` so it can be used when an instance of the `ITextToSpeech` interface is needed.

Section 12.4: Shared code

After you've created and registered your platform-specific classes you can start hooking them up to your shared code. The following page contains a button that triggers the text-to-speech functionality using a pre-defined sentence. It uses `DependencyService` to retrieve a platform-specific implementation of `ITextToSpeech` at run time using the native SDKs.

```
public MainPage ()
{
    var speakButton = new Button {
        Text = "Talk to me baby!",
        VerticalOptions = LayoutOptions.CenterAndExpand,
        HorizontalOptions = LayoutOptions.CenterAndExpand,
    };

    speakButton.Clicked += (sender, e) => {
        DependencyService.Get<ITextToSpeech>().Speak("Xamarin Forms likes eating cake by the ocean.");
    };

    Content = speakButton;
}
```

When you run this application on an iOS or Android device and tap the button you will hear the application speak the given sentence.

Chapter 13: Custom Renderers

Section 13.1: Accessing renderer from a native project

```
var renderer = Platform.GetRenderer(visualElement);

if (renderer == null)
{
    renderer = Platform.CreateRenderer(visualElement);
    Platform.SetRenderer(visualElement, renderer);
}

DoSomethingWithRender(renderer); // now you can do whatever you want with render
```

Section 13.2: Rounded label with a custom renderer for Frame (PCL & iOS parts)

First step : PCL part

```
using Xamarin.Forms;

namespace ProjectNamespace
{
    public class ExtendedFrame : Frame
    {
        /// <summary>
        /// The corner radius property.
        /// </summary>
        public static readonly BindableProperty CornerRadiusProperty =
            BindableProperty.Create("CornerRadius", typeof(double), typeof(ExtendedFrame), 0.0);

        /// <summary>
        /// Gets or sets the corner radius.
        /// </summary>
        public double CornerRadius
        {
            get { return (double)GetValue(CornerRadiusProperty); }
            set { SetValue(CornerRadiusProperty, value); }
        }
    }
}
```

Second step : iOS part

```
using ProjectNamespace;
using ProjectNamespace.iOS;
using Xamarin.Forms;
using Xamarin.Forms.Platform.iOS;

[assembly: ExportRenderer(typeof(ExtendedFrame), typeof(ExtendedFrameRenderer))]
namespace ProjectNamespace.iOS
{
    public class ExtendedFrameRenderer : FrameRenderer
    {
        protected override void OnElementChanged(ElementChangedEventArgs<Frame> e)
        {
            base.OnElementChanged(e);
        }
    }
}
```

```

        if (Element != null)
        {
            Layer.MasksToBounds = true;
            Layer.CornerRadius = (float)(Element as ExtendedFrame).CornerRadius;
        }
    }

    protected override void OnElementPropertyChanged(object sender,
System.ComponentModel.PropertyChangedEventArgs e)
    {
        base.OnElementPropertyChanged(sender, e);

        if (e.PropertyName == ExtendedFrame.CornerRadiusProperty.PropertyName)
        {
            Layer.CornerRadius = (float)(Element as ExtendedFrame).CornerRadius;
        }
    }
}

```

Third step : XAML code to call an ExtendedFrame

If you want to use it in a XAML part, don't forget to write this :

```
xmlns:controls="clr-namespace:ProjectNamespace;assembly:ProjectNamespace"
```

after

```
xmlns="http://xamarin.com/schemas/2014/forms"
xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
```

Now, you can use the ExtendedFrame like this :

```

<controls:ExtendedFrame
    VerticalOptions="FillAndExpand"
    HorizontalOptions="FillAndExpand"
    BackgroundColor="Gray"
    CornerRadius="35.0">
    <Frame.Content>
        <Label
            Text="MyText"
            TextColor="Blue"/>
    </Frame.Content>
</controls:ExtendedFrame>

```

Section 13.3: Custom renderer for ListView

Custom Renderers let developers customize the appearance and behavior of Xamarin.Forms controls on each platform. Developers could use features of native controls.

For example, we need to disable scroll in ListView. On iOS ListView is scrollable even if all items are placed on the screen and user shouldn't be able to scroll the list. Xamarin.Forms.ListView doesn't manage such setting. In this case, a renderer is coming to help.

Firstly, we should create custom control in PCL project, which will declare some required bindable property:

```

public class SuperListView : ListView
{

```



```

public static readonly BindableProperty IsScrollingEnableProperty =
    BindableProperty.Create(nameof(IsScrollingEnable),
        typeof(bool),
        typeof(SuperListView),
        true);

public bool IsScrollingEnable
{
    get { return (bool)GetValue(IsScrollingEnableProperty); }
    set { SetValue(IsScrollingEnableProperty, value); }
}
}

```

Next step will be creating a renderer for each platform.

iOS:

```

[assembly: ExportRenderer(typeof(SuperListView), typeof(SuperListViewRenderer))]
namespace SuperForms.iOS.Renderers
{
    public class SuperListViewRenderer : ListViewRenderer
    {
        protected override void OnElementChanged(ElementChangedEventArgs<ListView> e)
        {
            base.OnElementChanged(e);

            var superListView = Element as SuperListView;
            if (superListView == null)
                return;

            Control.ScrollEnabled = superListView.IsScrollingEnable;
        }
    }
}

```

And Android(Android's list doesn't have scroll if all items are placed on the screen, so we will not disable scrolling, but still we are able to use native properties):

```

[assembly: ExportRenderer(typeof(SuperListView), typeof(SuperListViewRenderer))]
namespace SuperForms.Droid.Renderers
{
    public class SuperListViewRenderer : ListViewRenderer
    {
        protected override void OnElementChanged(ElementChangedEventArgs<Xamarin.Forms.ListView> e)
        {
            base.OnElementChanged(e);

            var superListView = Element as SuperListView;
            if (superListView == null)
                return;
        }
    }
}

```

Element property of renderer is my SuperListView control from PCL project.

Control property of renderer is native control. `Android.Widget.ListView` for Android and `UIKit.UITableView` for iOS.

And how we will use it in XAML:

```
<ContentPage x:Name="Page"
    xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    xmlns:controls="clr-namespace:SuperForms.Controls;assembly=SuperForms.Controls"
    x:Class="SuperForms.Samples.SuperListViewPage">

    <controls:SuperListView ItemsSource="{Binding Items, Source={x:Reference Page}}"
        IsScrollingEnable="false"
        Margin="20">
        <controls:SuperListView.ItemTemplate>
            <DataTemplate>
                <ViewCell>
                    <Label Text="{Binding .}"/>
                </ViewCell>
            </DataTemplate>
        </controls:SuperListView.ItemTemplate>
    </controls:SuperListView>
</ContentPage>
```

.cs file of page:

```
public partial class SuperListViewPage : ContentPage
{
    private ObservableCollection<string> _items;

    public ObservableCollection<string> Items
    {
        get { return _items; }
        set
        {
            _items = value;
            OnPropertyChanged();
        }
    }

    public SuperListViewPage()
    {
        var list = new SuperListView();

        InitializeComponent();

        var items = new List<string>(10);
        for (int i = 1; i <= 10; i++)
        {
            items.Add($"Item {i}");
        }

        Items = new ObservableCollection<string>(items);
    }
}
```

Section 13.4: Custom Renderer for BoxView

Custom Renderer help to allows to add new properties and render them differently in native platform that can not be otherwise does through shared code. In this example we will add radius and shadow to a boxview.

Firstly, we should create custom control in PCL project, which will declare some required bindable property:

```

namespace Mobile.Controls
{
    public class ExtendedBoxView : BoxView
    {
        /// <summary>
        /// Represents the background color of the button.
        /// </summary>
        public static readonly BindableProperty BorderRadiusProperty =
BindableProperty.Create<ExtendedBoxView, double>(p => p.BorderRadius, 0);

        public double BorderRadius
        {
            get { return (double)GetValue(BorderRadiusProperty); }
            set { SetValue(BorderRadiusProperty, value); }
        }

        public static readonly BindableProperty StrokeProperty =
BindableProperty.Create<ExtendedBoxView, Color>(p => p.Stroke, Color.Transparent);

        public Color Stroke
        {
            get { return (Color)GetValue(StrokeProperty); }
            set { SetValue(StrokeProperty, value); }
        }

        public static readonly BindableProperty StrokeThicknessProperty =
BindableProperty.Create<ExtendedBoxView, double>(p => p.StrokeThickness, 0);

        public double StrokeThickness
        {
            get { return (double)GetValue(StrokeThicknessProperty); }
            set { SetValue(StrokeThicknessProperty, value); }
        }
    }
}

```

Next step will be creating a renderer for each platform.

iOS:

```

[assembly: ExportRenderer(typeof(ExtendedBoxView), typeof(ExtendedBoxViewRenderer))]
namespace Mobile.iOS.Renderers
{
    public class ExtendedBoxViewRenderer : VisualElementRenderer<BoxView>
    {
        public ExtendedBoxViewRenderer()
        {
        }

        protected override void OnElementChanged(ElementChangedEventArgs<BoxView> e)
        {
            base.OnElementChanged(e);
            if (Element == null)
                return;

            Layer.MasksToBounds = true;
            Layer.CornerRadius = (float)((ExtendedBoxView)this.Element).BorderRadius / 2.0f;
        }

        protected override void OnElementPropertyChanged(object sender,

```

```

System.ComponentModel.PropertyChangedEventArgs e)
{
    base.OnElementPropertyChanged(sender, e);
    if (e.PropertyName == ExtendedBoxView.BorderRadiusProperty.PropertyName)
    {
        SetNeedsDisplay();
    }
}

public override void Draw(CGRect rect)
{
    ExtendedBoxView roundedBoxView = (ExtendedBoxView)this.Element;
    using (var context = UIGraphics.GetCurrentContext())
    {
        context.SetFillColor(roundedBoxView.Color.ToCGColor());
        context.SetStrokeColor(roundedBoxView.Stroke.ToCGColor());
        context.SetLineWidth((float)roundedBoxView.StrokeThickness);

        var rCorner = this.Bounds.Inset((int)roundedBoxView.StrokeThickness / 2,
(int)roundedBoxView.StrokeThickness / 2);

        nfloat radius = (nfloat)roundedBoxView.BorderRadius;
        radius = (nfloat)Math.Max(0, Math.Min(radius, Math.Max(rCorner.Height / 2,
rCorner.Width / 2)));

        var path = CGPath.FromRoundedRect(rCorner, radius, radius);
        context.AddPath(path);
        context.DrawPath(CGPathDrawingMode.FillStroke);
    }
}
}
}

```

Again you can customize however you want inside the draw method.

And same for Android:

```

[assembly: ExportRenderer(typeof(ExtendedBoxView), typeof(ExtendedBoxViewRenderer))]
namespace Mobile.Droid
{
    /// <summary>
    ///
    /// </summary>
    public class ExtendedBoxViewRenderer : VisualElementRenderer<BoxView>
    {
        /// <summary>
        ///
        /// </summary>
        public ExtendedBoxViewRenderer()
        {
        }

        /// <summary>
        ///
        /// </summary>
        /// <param name="e"></param>
        protected override void OnElementChanged(ElementChangedEventArgs<BoxView> e)
        {
            base.OnElementChanged(e);
        }
    }
}

```

```

        SetWillNotDraw(false);

        Invalidate();
    }

    /// <summary>
    ///
    /// </summary>
    /// <param name="sender"></param>
    /// <param name="e"></param>
    protected override void OnElementPropertyChanged(object sender,
System.ComponentModel.PropertyChangedEventArgs e)
    {
        base.OnElementPropertyChanged(sender, e);

        if (e.PropertyName == ExtendedBoxView.BorderRadiusProperty.PropertyName)
        {
            Invalidate();
        }
    }

    /// <summary>
    ///
    /// </summary>
    /// <param name="canvas"></param>
    public override void Draw(Canvas canvas)
    {
        var box = Element as ExtendedBoxView;
        base.Draw(canvas);
        Paint myPaint = new Paint();

        myPaint.SetStyle(Paint.Style.Stroke);
        myPaint.StrokeWidth = (float)box.StrokeThickness;
        myPaint.SetARGB(convertTo255ScaleColor(box.Color.A),
convertTo255ScaleColor(box.Color.R), convertTo255ScaleColor(box.Color.G),
convertTo255ScaleColor(box.Color.B));
        myPaint.SetShadowLayer(20, 0, 5, Android.Graphics.Color.Argb(100, 0, 0, 0));

        SetLayerType(Android.Views.LayerType.Software, myPaint);

        var number = (float)box.StrokeThickness / 2;
        RectF rectF = new RectF(
            number, // left
            number, // top
            canvas.Width - number, // right
            canvas.Height - number // bottom
        );

        var radius = (float)box.BorderRadius;
        canvas.DrawRoundRect(rectF, radius, radius, myPaint);
    }

    /// <summary>
    ///
    /// </summary>
    /// <param name="color"></param>
    /// <returns></returns>
    private int convertTo255ScaleColor(double color)
    {
        return (int) Math.Ceiling(color * 255);
    }
}

```

```
}
```

```
}
```

The XAML:

We first reference to our control with the namespace we defined earlier.

```
xmlns:Controls="clr-namespace:Mobile.Controls"
```

We then use the Control as follows and use properties defined at the beginning:

```
<Controls:ExtendedBoxView
  x:Name="search_boxview"
  Color="#444"
  BorderRadius="5"
  HorizontalOptions="CenterAndExpand"
/>
```

Section 13.5: Rounded BoxView with selectable background color

First step : PCL part

```
public class RoundedBoxView : BoxView
{
    public static readonly BindableProperty CornerRadiusProperty =
        BindableProperty.Create("CornerRadius", typeof(double), typeof(RoundedEntry),
        default(double));

    public double CornerRadius
    {
        get
        {
            return (double)GetValue(CornerRadiusProperty);
        }
        set
        {
            SetValue(CornerRadiusProperty, value);
        }
    }

    public static readonly BindableProperty FillColorProperty =
        BindableProperty.Create("FillColor", typeof(string), typeof(RoundedEntry),
        default(string));

    public string FillColor
    {
        get
        {
            return (string)GetValue(FillColorProperty);
        }
        set
        {
            SetValue(FillColorProperty, value);
        }
    }
}
```

Second step : Droid part

```
[assembly: ExportRenderer(typeof(RoundedBoxView), typeof(RoundedBoxViewRenderer))]
namespace MyNamespace.Droid
{
    public class RoundedBoxViewRenderer : VisualElementRenderer<BoxView>
    {
        protected override void OnElementChanged(ElementChangedEventArgs<BoxView> e)
        {
            base.OnElementChanged(e);
            SetWillNotDraw(false);
            Invalidate();
        }

        protected override void OnElementPropertyChanged(object sender,
System.ComponentModel.PropertyChangedEventArgs e)
        {
            base.OnElementPropertyChanged(sender, e);
            SetWillNotDraw(false);
            Invalidate();
        }

        public override void Draw(Canvas canvas)
        {
            var box = Element as RoundedBoxView;
            var rect = new Rect();
            var paint = new Paint
            {
                Color = Xamarin.Forms.Color.FromHex(box.FillColor).ToAndroid(),
                AntiAlias = true,
            };

            GetDrawingRect(rect);

            var radius = (float)(rect.Width() / box.Width * box.CornerRadius);

            canvas.DrawRoundRect(new RectF(rect), radius, radius, paint);
        }
    }
}
```

Third step : iOS part

```
[assembly: ExportRenderer(typeof(RoundedBoxView), typeof(RoundedBoxViewRenderer))]
namespace MyNamespace.iOS
{
    public class RoundedBoxViewRenderer : BoxRenderer
    {
        protected override void OnElementChanged(ElementChangedEventArgs<BoxView> e)
        {
            base.OnElementChanged(e);

            if (Element != null)
            {
                Layer.CornerRadius = (float)(Element as RoundedBoxView).CornerRadius;
                Layer.BackgroundColor = Color.FromHex((Element as
RoundedBoxView).FillColor).ToCGColor();
            }
        }

        protected override void OnElementPropertyChanged(object sender,
```

```
System.ComponentModel.PropertyChangedEventArgs e)
{
    base.OnElementPropertyChanged(sender, e);

    if (Element != null)
    {
        Layer.CornerRadius = (float)(Element as RoundedBoxView).CornerRadius;
        Layer.BackgroundColor = (Element as RoundedBoxView).FillColor.ToCGColor();
    }
}
}
```


Chapter 14: Caching

Section 14.1: Caching using Akavache

About Akavache

[Akavache](#) is an incredibly useful library providing reach functionality of caching your data. Akavache provides a key-value storage interface and works on the top of SQLite3. You do not need to keep your schema synced as it's actually No-SQL solution which makes it perfect for most of the mobile applications especially if you need your app to be updated often without data loss.

Recommendations for Xamarin

Akavache is definitely the best caching library for Xamarin application if only you do not need to operate with strongly relative data, binary or really big amounts of data. Use Akavache in the following cases:

- You need your app to cache the data for a given period of time (you can configure expiration timeout for each entity being saved);
- You want your app to work offline;
- It's hard to determine and freeze the schema of your data. For example, you have lists containing different typed objects;
- It's enough for you to have simple key-value access to the data and you do not need to make complex queries.

Akavache is not a "silver bullet" for data storage so think twice about using it in the following cases:

- Your data entities have many relations between each other;
- You don't really need your app to work offline;
- You have huge amount of data to be saved locally;
- You need to migrate your data from version to version;
- You need to perform complex queries typical for SQL like grouping, projections etc.

Actually you can manually migrate your data just by reading and writing it back with updated fields.

Simple example

Interacting with Akavache is primarily done through an object called `BlobCache`.

Most of the Akavache's methods returns reactive observables, but you also can just await them thanks to extension methods.

```
using System.Reactive.Linq; // IMPORTANT - this makes await work!

// Make sure you set the application name before doing any inserts or gets
BlobCache.ApplicationName = "AkavacheExperiment";

var myToaster = new Toaster();
await BlobCache.UserAccount.InsertObject("toaster", myToaster);

//
// ...later, in another part of town...
//
```

```
// Using async/await
var toaster = await BlobCache.UserAccount.GetObject<Toaster>("toaster");

// or without async/await
Toaster toaster;

BlobCache.UserAccount.GetObject<Toaster>("toaster")
    .Subscribe(x => toaster = x, ex => Console.WriteLine("No Key!"));
```

Error handling

```
Toaster toaster;

try {
    toaster = await BlobCache.UserAccount.GetObjectAsync("toaster");
} catch (KeyNotFoundException ex) {
    toaster = new Toaster();
}

// Or without async/await:
toaster = await BlobCache.UserAccount.GetObjectAsync<Toaster>("toaster")
    .Catch(Observable.Return(new Toaster()));
```

Chapter 15: Gestures

Section 15.1: Make an Image tappable by adding a TapGestureRecognizer

There are a couple of default recognizers available in Xamarin.Forms, one of them is the TapGestureRecognizer.

You can add them to virtually any visual element. Have a look at a simple implementation which binds to an Image. Here is how to do it in code.

```
var tappedCommand = new Command(() =>
{
    //handle the tap
});

var tapGestureRecognizer = new TapGestureRecognizer { Command = tappedCommand };
image.GestureRecognizers.Add(tapGestureRecognizer);
```

Or in XAML:

```
<Image Source="tapped.jpg">
  <Image.GestureRecognizers>
    <TapGestureRecognizer
      Command="{Binding TappedCommand}"
      NumberOfTapsRequired="2" />
  </Image.GestureRecognizers>
</Image>
```

Here the command is set by using data binding. As you can see you can also set the NumberOfTapsRequired to enable it for more taps before it takes action. The default value is 1 tap.

Other gestures are Pinch and Pan.

Section 15.2: Gesture Event

When we put the control of Label, the Label does not provide any event. <Label x:Name="lblSignUp Text="Don't have account?"/> as shown the Label only display purpose only.

When the user want to replace Button with Label, then we give the event for Label. As shown below:

XAML

```
<Label x:Name="lblSignUp" Text="Don't have an account?" Grid.Row="8" Grid.Column="1"
Grid.ColumnSpan="2">
  <Label.GestureRecognizers>
    <TapGestureRecognizer
      Tapped="lblSignUp_Tapped" />
  </Label.GestureRecognizers>
```

C#

```
var lblSignUp_Tapped = new TapGestureRecognizer();
lblSignUp_Tapped.Tapped += (s,e) =>
{
    //
    // Do your work here.
```

```
//  
};  
lblSignUp.GestureRecognizers.Add(lblSignUp_Tapped);
```

The Screen Below shown the Label Event. Screen 1 : The Label "Don't have an account?" as shown in Bottom .

Username/Email

Password

LOGIN

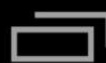
Forgot your login details?

- OR -

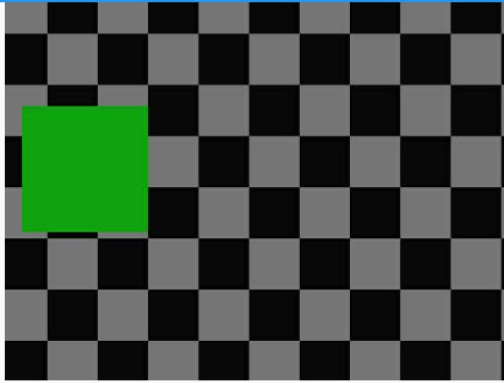
LOGIN WITH FACEBOOK

LOGIN WITH GOOGLE

Don't have an account?



When the User click the Label "Don't have an account?", it will Navigate to Sign Up Screen.



PICK YOUR PET PHOTO

TAKE YOUR PET PHOTO

Your Profile

UserName/Email

Password

Your Pet Profile

Pet Name

Pet Age

SIGNUP



For more details:

Section 15.3: Zoom an Image with the Pinch gesture

In order to make an Image (or any other visual element) zoomable we have to add a PinchGestureRecognizer to it. Here is how to do it in code:

```
var pinchGesture = new PinchGestureRecognizer();
pinchGesture.PinchUpdated += (s, e) => {
    // Handle the pinch
};

image.GestureRecognizers.Add(pinchGesture);
```

But it can also be done from XAML:

```
<Image Source="waterfront.jpg">
    <Image.GestureRecognizers>
        <PinchGestureRecognizer PinchUpdated="OnPinchUpdated" />
    </Image.GestureRecognizers>
</Image>
```

In the accompanied event handler you should provide the code to zoom your image. Of course other uses can be implement as well.

```
void OnPinchUpdated (object sender, PinchGestureUpdatedEventArgs e)
{
    // ... code here
}
```

Other gestures are Tap and Pan.

Section 15.4: Show all of the zoomed Image content with the PanGestureRecognizer

When you have a zoomed Image (or other content) you may want to drag around the Image to show all of its content in the zoomed in state.

This can be achieved by implementing the PanGestureRecognizer. From code this looks like so:

```
var panGesture = new PanGestureRecognizer();
panGesture.PanUpdated += (s, e) => {
    // Handle the pan
};

image.GestureRecognizers.Add(panGesture);
```

This can also be done from XAML:

```
<Image Source="MonoMonkey.jpg">
    <Image.GestureRecognizers>
        <PanGestureRecognizer PanUpdated="OnPanUpdated" />
    </Image.GestureRecognizers>
</Image>
```

In the code-behind event you can now handle the panning accordingly. Use this method signature to handle it:

```
void OnPanUpdated (object sender, PanUpdatedEventArgs e)
{
    // Handle the pan
}
```

Section 15.5: Tap Gesture

With the Tap Gesture, you can make any UI-Element clickable (Images, Buttons, StackLayouts, ...):

(1) In code, using the event:

```
var tapGestureRecognizer = new TapGestureRecognizer();
tapGestureRecognizer.Tapped += (s, e) => {
    // handle the tap
};
image.GestureRecognizers.Add(tapGestureRecognizer);
```

(2) In code, using ICommand (with MVVM-Pattern, for example):

```
var tapGestureRecognizer = new TapGestureRecognizer();
tapGestureRecognizer.SetBinding (TapGestureRecognizer.CommandProperty, "TapCommand");
image.GestureRecognizers.Add(tapGestureRecognizer);
```

(3) Or in Xaml (with event and ICommand, only one is needed):

```
<Image Source="tapped.jpg">
    <Image.GestureRecognizers>
        <TapGestureRecognizer Tapped="OnTapGestureRecognizerTapped" Command="{Binding TapCommand}" />
    />
</Image.GestureRecognizers>
</Image>
```

Section 15.6: Place a pin where the user touched the screen with MR.Gestures

Xamarins built in gesture recognizers provide only very basic touch handling. E.g. there is no way to get the position of a touching finger. MR.Gestures is a component which adds 14 different touch handling events. The position of the touching fingers is part of the EventArgs passed to all MR.Gestures events.

If you want to place a pin anywhere on the screen, the easiest way is to use an MR.Gestures.AbsoluteLayout which handles the Tapping event.

```
<mr:AbsoluteLayout x:Name="MainLayout" Tapping="OnTapping">
    ...
</mr:AbsoluteLayout>
```

As you can see the Tapping="OnTapping" also feels more like .NET than Xamarins syntax with the nested GestureRecognizers. That syntax was copied from iOS and it smells a bit for .NET developers.

In your code behind you could add the OnTapping handler like this:

```
private void OnTapping(object sender, MR.Gestures.TapEventArgs e)
{
    if (e.Touches?.Length > 0)
    {
        Point touch = e.Touches[0];
    }
}
```

```
var image = new Image() { Source = "pin" };
MainLayout.Children.Add(image, touch);
}
}
```

Instead of the Tapping event, you could also use the TappingCommand and bind to your ViewModel, but that would complicate things in this simple example.

More samples for MR.Gestures can be found in the [GestureSample app on GitHub](#) and on the [MR.Gestures website](#). These also show how to use all the other touch events with event handlers, commands, MVVM, ...

Chapter 16: Data Binding

Section 16.1: Basic Binding to ViewModel

EntryPoint.xaml:

```
<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
             xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
             xmlns:vm="clr-namespace:MyAssembly.ViewModel;assembly=MyAssembly"
             x:Class="MyAssembly.EntryPage">
  <ContentPage.BindingContext>
    <vm:MyViewModel />
  </ContentPage.BindingContext>
  <ContentPage.Content>
    <StackLayout VerticalOptions="FillAndExpand"
                 HorizontalOptions="FillAndExpand"
                 Orientation="Vertical"
                 Spacing="15">
      <Label Text="Name:" />
      <Entry Text="{Binding Name}" />
      <Label Text="Phone:" />
      <Entry Text="{Binding Phone}" />
      <Button Text="Save" Command="{Binding SaveCommand}" />
    </StackLayout>
  </ContentPage.Content>
</ContentPage>
```

MyViewModel.cs:

```
using System;
using System.ComponentModel;

namespace MyAssembly.ViewModel
{
  public class MyViewModel : INotifyPropertyChanged
  {
    private string _name = String.Empty;
    private string _phone = String.Empty;

    public string Name
    {
      get { return _name; }
      set
      {
        if (_name != value)
        {
          _name = value;
          OnPropertyChanged(nameof(Name));
        }
      }
    }

    public string Phone
    {
      get { return _phone; }
      set
      {
        if (_phone != value)
```

```

        {
            _phone = value;
            OnPropertyChanged(nameof(Phone));
        }
    }

    public ICommand SaveCommand { get; private set; }

    public MyViewModel()
    {
        SaveCommand = new Command(SaveCommandExecute);
    }

    private void SaveCommandExecute()
    {
    }

    public event PropertyChangedEventHandler PropertyChanged;

    protected virtual void OnPropertyChanged(string propertyName)
    {
        PropertyChanged?.Invoke(this, new PropertyChangedEventArgs(propertyName));
    }
}

```

Chapter 17: Working with Maps

Section 17.1: Adding a map in Xamarin.Forms (Xamarin Studio)

You can simply use the native map APIs on each platform with Xamarin Forms. All you need is to download the *Xamarin.Forms.Maps* package from nuget and install it to each project (including the PCL project).

Maps Initialization

First of all you have to add this code to your platform-specific projects. For doing this you have to add the `Xamarin.FormsMaps.Init` method call, like in the examples below.

iOS project

File AppDelegate.cs

```
[Register("AppDelegate")]
public partial class AppDelegate : Xamarin.Forms.Platform.iOS.FormsApplicationDelegate
{
    public override bool FinishedLaunching(UIApplication app, NSDictionary options)
    {
        Xamarin.Forms.Forms.Init();
        Xamarin.FormsMaps.Init();

        LoadApplication(new App());

        return base.FinishedLaunching(app, options);
    }
}
```

Android project

File MainActivity.cs

```
[Activity(Label = "MapExample.Droid", Icon = "@drawable/icon", Theme = "@style/MyTheme",
MainLauncher = true, ConfigurationChanges = ConfigChanges.ScreenSize | ConfigChanges.Orientation)]
public class MainActivity : Xamarin.Forms.Platform.Android.FormsAppCompatActivity
{
    protected override void OnCreate(Bundle bundle)
    {
        TabLayoutResource = Resource.Layout.Tabbar;
        ToolbarResource = Resource.Layout.Toolbar;

        base.OnCreate(bundle);

        Xamarin.Forms.Forms.Init(this, bundle);
        Xamarin.FormsMaps.Init(this, bundle);

        LoadApplication(new App());
    }
}
```

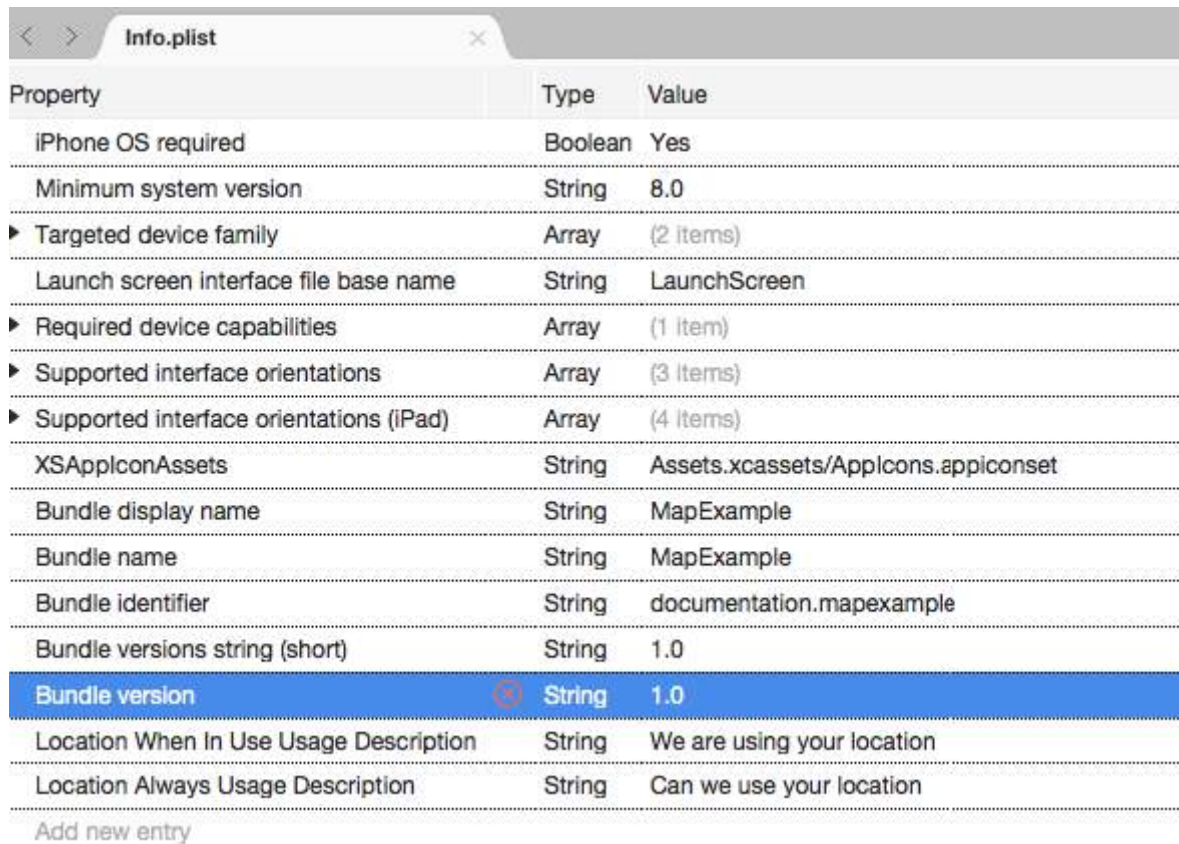
Platform Configuration

Additional configuration steps are required on some platforms before the map will display.

iOS project

In iOS project you just have to add 2 entries to your *Info.plist* file:

- `NSLocationWhenInUseUsageDescription` *string* with value We are **using** your location
- `NSLocationAlwaysUsageDescription` *string* with value Can we use your location



Property	Type	Value
iPhone OS required	Boolean	Yes
Minimum system version	String	8.0
▶ Targeted device family	Array	(2 items)
Launch screen interface file base name	String	LaunchScreen
▶ Required device capabilities	Array	(1 item)
▶ Supported interface orientations	Array	(3 items)
▶ Supported interface orientations (iPad)	Array	(4 items)
XSApplconAssets	String	Assets.xcassets/AppIcons.appiconset
Bundle display name	String	MapExample
Bundle name	String	MapExample
Bundle identifier	String	documentation.mapexample
Bundle versions string (short)	String	1.0
Bundle version	String	1.0
Location When In Use Usage Description	String	We are using your location
Location Always Usage Description	String	Can we use your location

Add new entry

Android project

To use Google Maps you have to generate an API key and add it to your project. Follow the instruction below to get this key:

1. (Optional) Find where your keytool tool location (default is `/System/Library/Frameworks/JavaVM.framework/Versions/Current/Commands`)
2. (Optional) Open terminal and go to your keytool location:

```
cd /System/Library/Frameworks/JavaVM.framework/Versions/Current/Commands
```

3. Run the following keytool command:

```
keytool -list -v -keystore "/Users/[USERNAME]/.local/share/Xamarin/Mono for Android/debug.keystore" -alias androiddebugkey -storepass android -keypass android
```

Where [USERNAME] is, obviously, your current user folder. You should get something similar to this in the output:

```
Alias name: androiddebugkey
Creation date: Jun 30, 2016
Entry type: PrivateKeyEntry
```

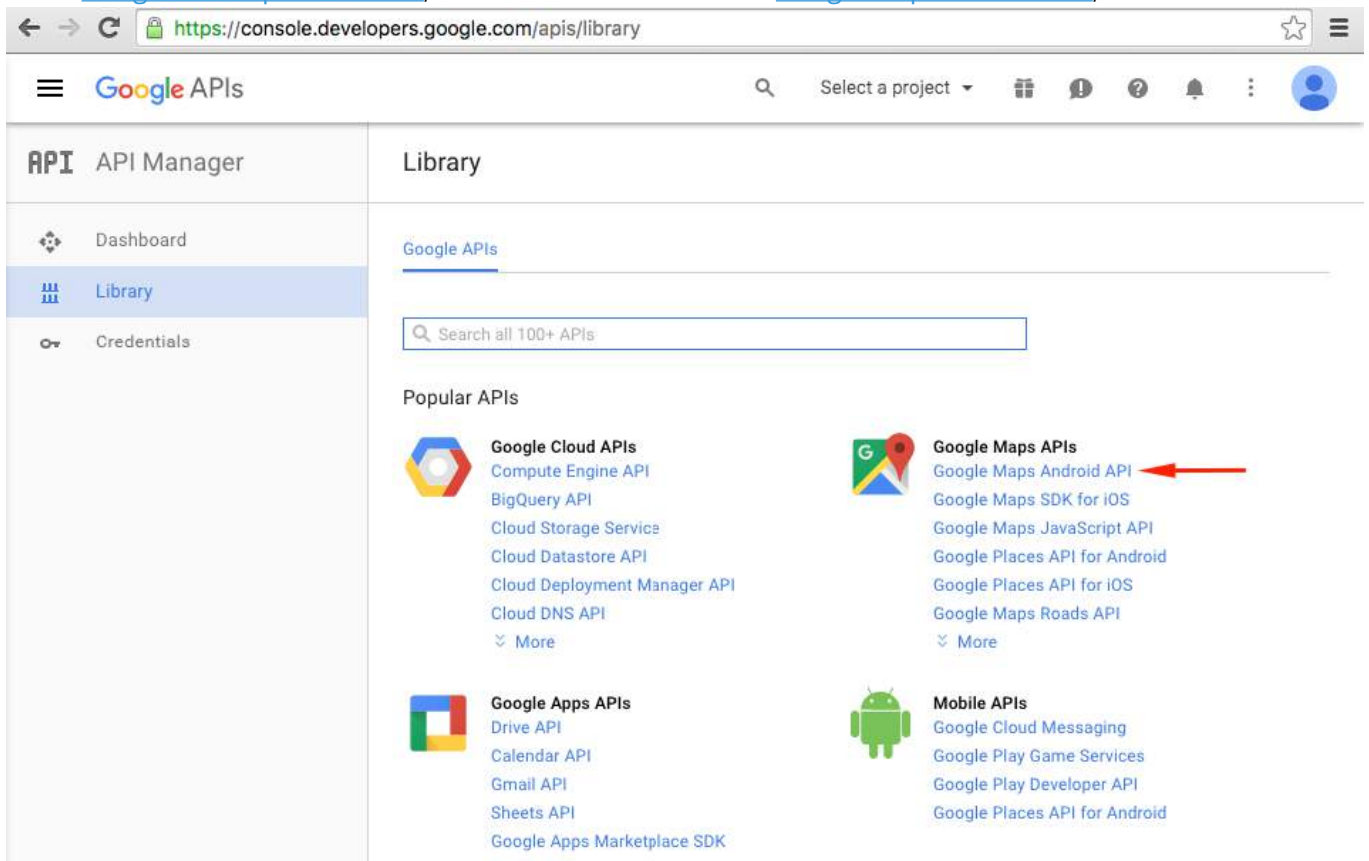
```
Certificate chain length: 1
Certificate[1]:
Owner: CN=Android Debug, O=Android, C=US
Issuer: CN=Android Debug, O=Android, C=US
Serial number: 4b5ac934
Valid from: Thu Jun 30 10:22:00 EEST 2016 until: Sat Jun 23 10:22:00 EEST 2046
Certificate fingerprints:
MD5: 4E:49:A7:14:99:D6:AB:9F:AA:C7:07:E2:6A:1A:1D:CA
SHA1: 57:A1:E5:23:CE:49:2F:17:8D:8A:EA:87:65:44:C1:DD:1C:DA:51:95
SHA256:
70:E1:F3:5B:95:69:36:4A:82:A9:62:F3:67:B6:73:A4:DD:92:95:51:44:E3:4C:3D:9E:ED:99:03:09:9F:90:
3F
Signature algorithm name: SHA256withRSA
Version: 3
```

4. All we need in this output is the SHA1 certificate fingerprint. In our case it equals to this:

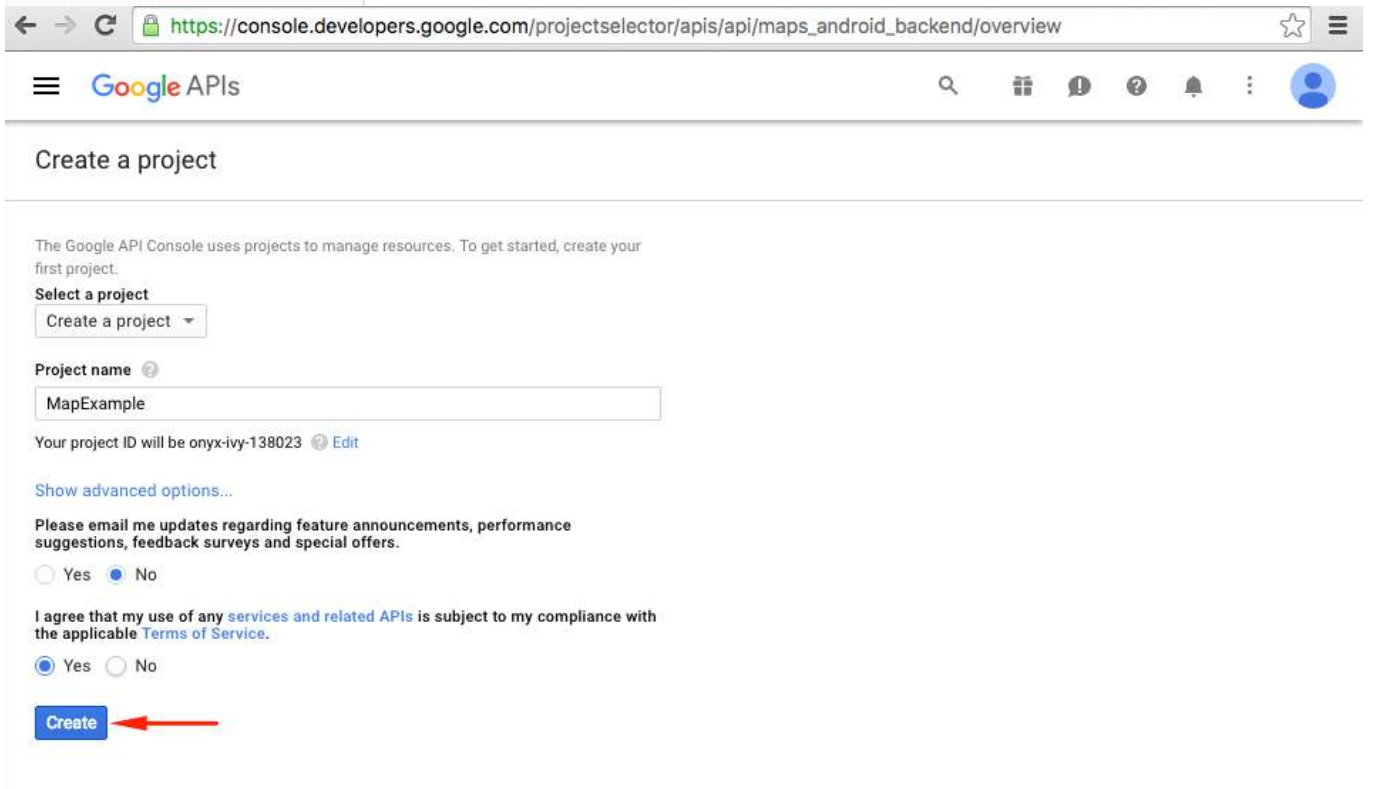
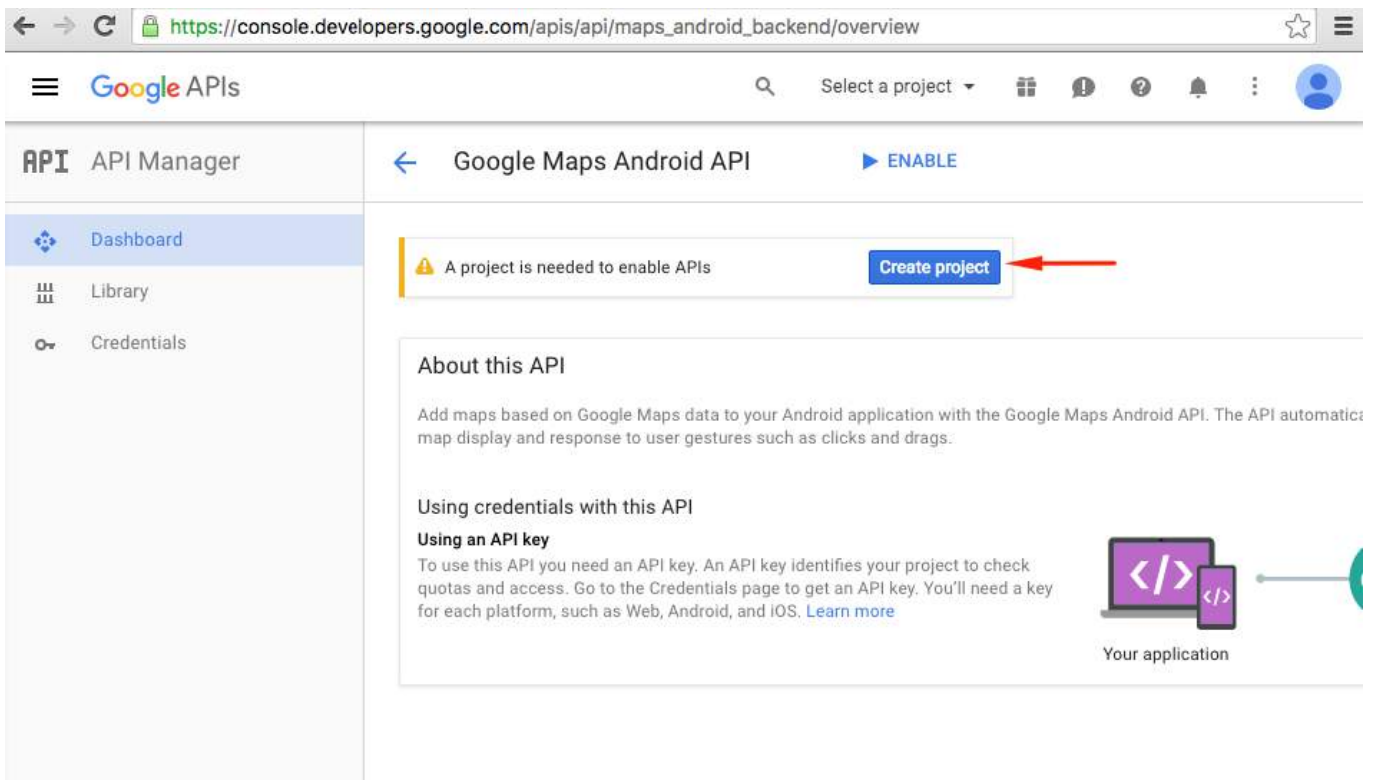
```
57:A1:E5:23:CE:49:2F:17:8D:8A:EA:87:65:44:C1:DD:1C:DA:51:95
```

Copy or save somewhere this key. We will need it later on.

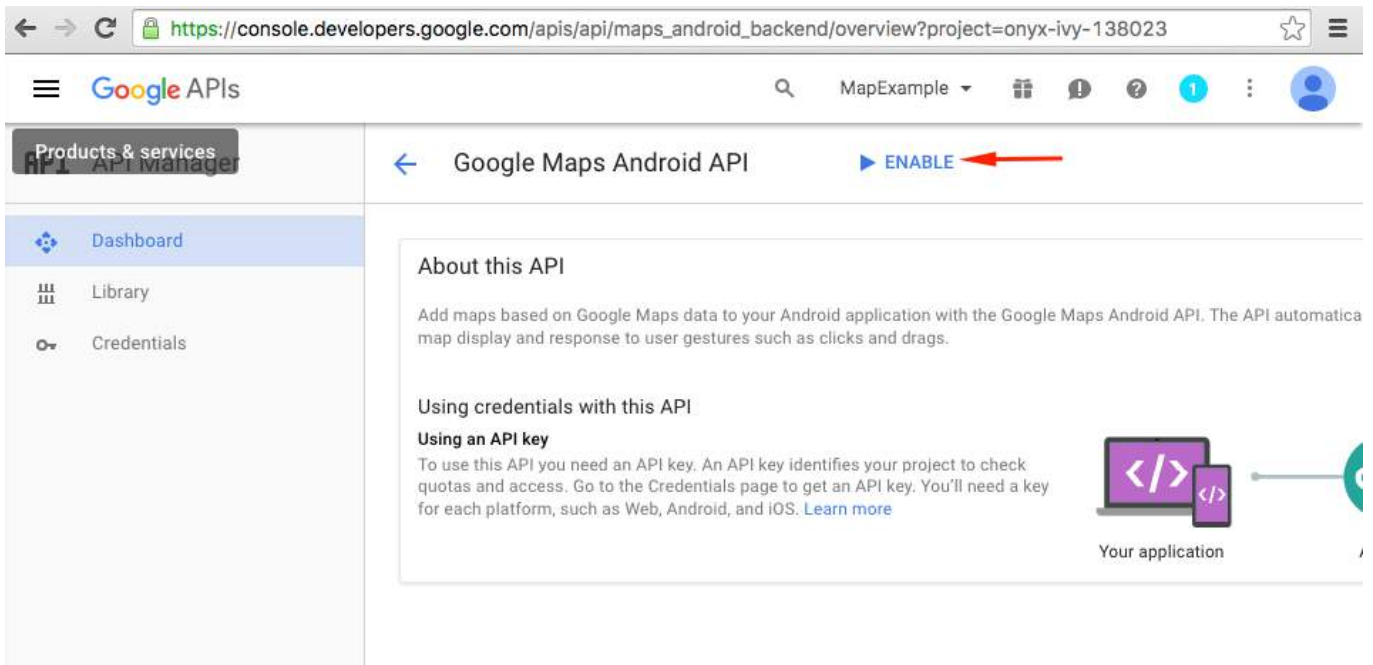
5. Go to [Google Developers Console](https://console.developers.google.com/apis/library), in our case we have to add [Google Maps Android API](#), so choose it:



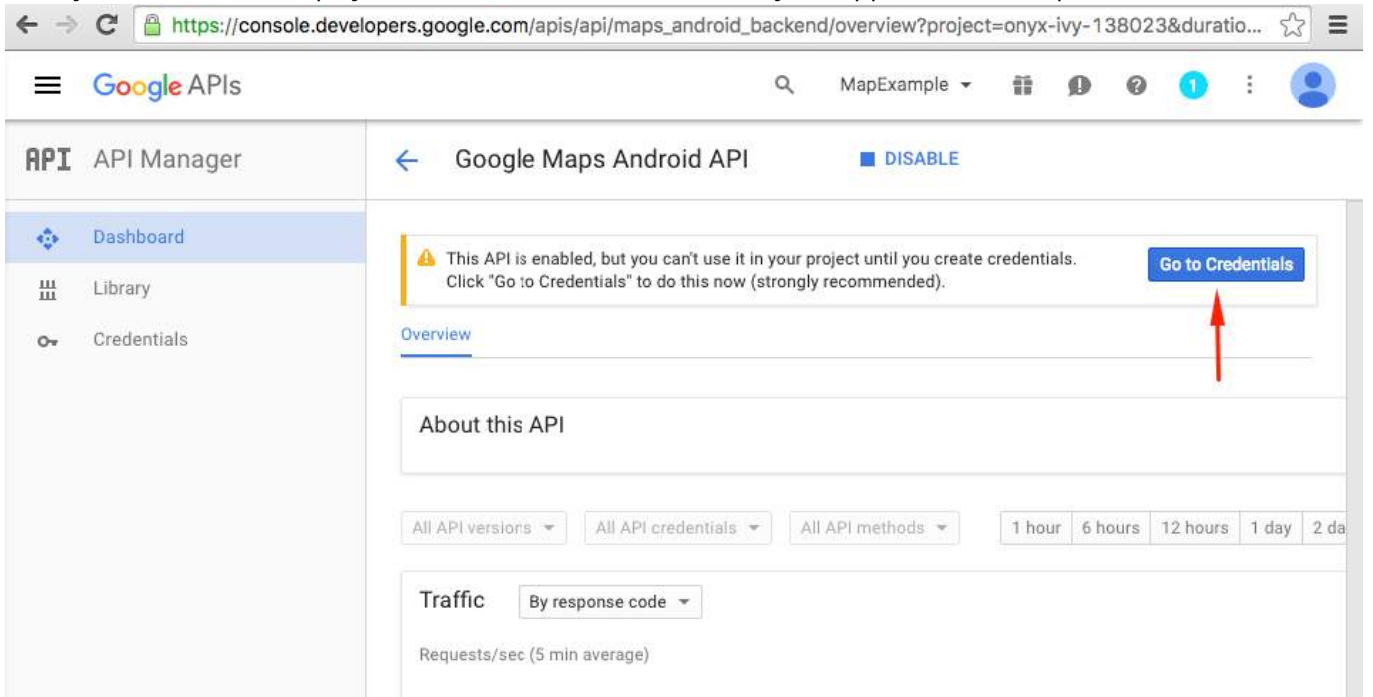
6. Google will ask you to create a project to enable APIs, follow this tip and create the project:



7. Enable Google Maps API for your project:



After you have enabled api, you have to create credentials for your app. Follow this tip:



8. On the next page choose the Android platform, tap on "What credentials do I need?" button, create a name for your API key, tap on "Add package name and fingerprint", enter your package name and your SHA1 fingerprint from the step 4 and finally create an API key:

API Manager

Credentials

Add credentials to your project

- Find out what kind of credentials you need
Calling Google Maps Android API from Android
- Create an API key
Name
MapExample Maps
Restrict usage to your Android apps (Optional)
Add your package name and SHA-1 signing-certificate fingerprint to restrict usage to your Android apps [Learn more](#)
Get the package name from your AndroidManifest.xml file. Then use the following command to get the fingerprint:

```
$ keytool -list -v -keystore mystore.keystore
```

Package name	SHA-1 certificate fingerprint
documentation.mapexample	57:A1:E5:23:CE:49:2F:17:8D:8A:EA:87:65:44:C1:DD:1C:DA:51:95

+ Add package name and fingerprint

Create API key
- Get your credentials

Cancel

To find your package name in Xamarin Studio go to your .Droid solution -> AndroidManifest.xml:

Xamarin Studio Enterprise

Info.plist Resource.designer.cs AndroidManifest.xml

Application name: MapExample

Package name: documentation.mapexample

Application icon: [dropdown]

Version number: 1

Version name: 1.0

Minimum Android version: Override - Android 4.0.3 (API level 15)

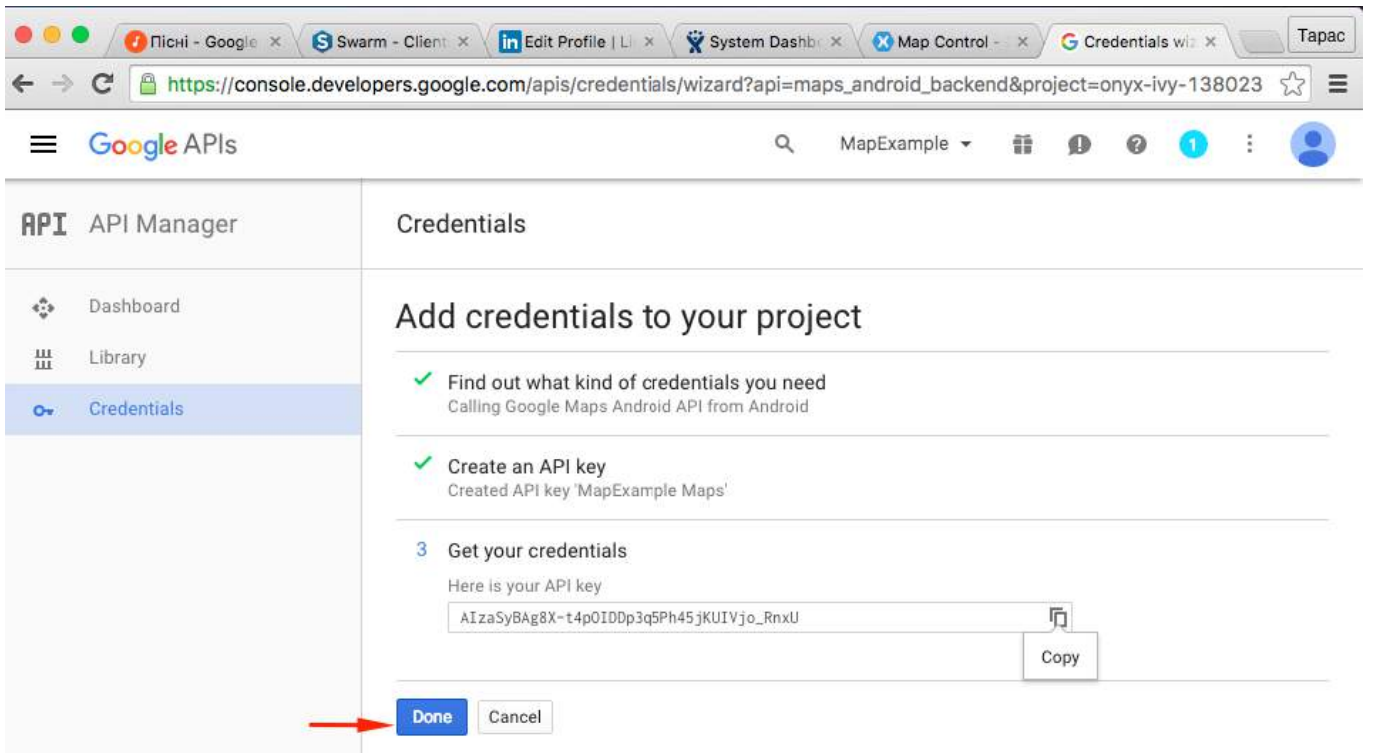
Target Android version: Automatic - use target framework version (API 23)

Install location: Default

Required permissions:

- AccessCheckinProperties
- AccessCoarseLocation
- AccessFineLocation
- AccessLocationExtraCommands
- AccessMockLocation

- After creation copy the new API key (don't forget to press the "Done" button after) and paste it to your AndroidManifest.xml file:

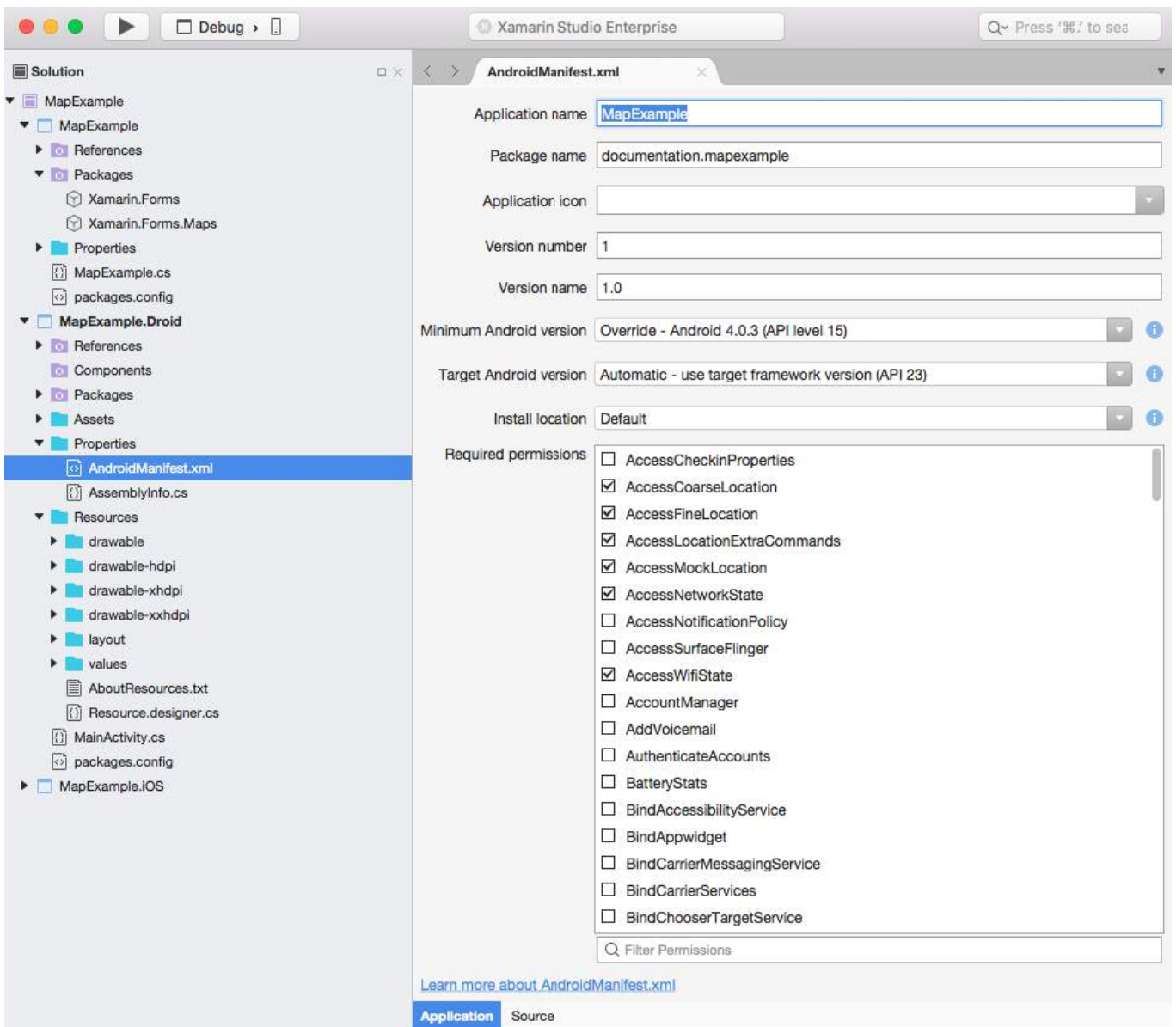


File AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest
  xmlns:android="http://schemas.android.com/apk/res/android"
  android:versionCode="1"
  android:versionName="1.0"
  package="documentation.mapexample">
  <uses-sdk
    android:minSdkVersion="15" />
  <application
    android:label="MapExample">
    <meta-data
      android:name="com.google.android.geo.API_KEY"
      android:value="AIzaSyBAG8X-t4p0IDDp3q5Ph45jKUIVjo_RnxU" />
    <meta-data
      android:name="com.google.android.gms.version"
      android:value="@integer/google_play_services_version" />
  </application>
</manifest>
```

You'll also need to enable some permissions in your manifest to enable some additional features:

- Access Coarse Location
- Access Fine Location
- Access Location Extra Commands
- Access Mock Location
- Access Network State
- Access Wifi State
- Internet



Although, the last two permissions are required to download Maps data. Read about [Android permissions](#) to learn more. That's all the steps for Android configuration.

Note: if you want to run your app on android simulator, you have to install Google Play Services on it. Follow [this tutorial](#) to install Play Services on Xamarin Android Player. If you can't find google play services update after the play store installation, you can update it directly from your app, where you have dependency on maps services

Adding a map

Adding map view to your crossplatform project is quite simple. Here is an example of how you can do it (I'm using PCL project without XAML).

PCL project

File *MapExample.cs*

```
public class App : Application
```

```

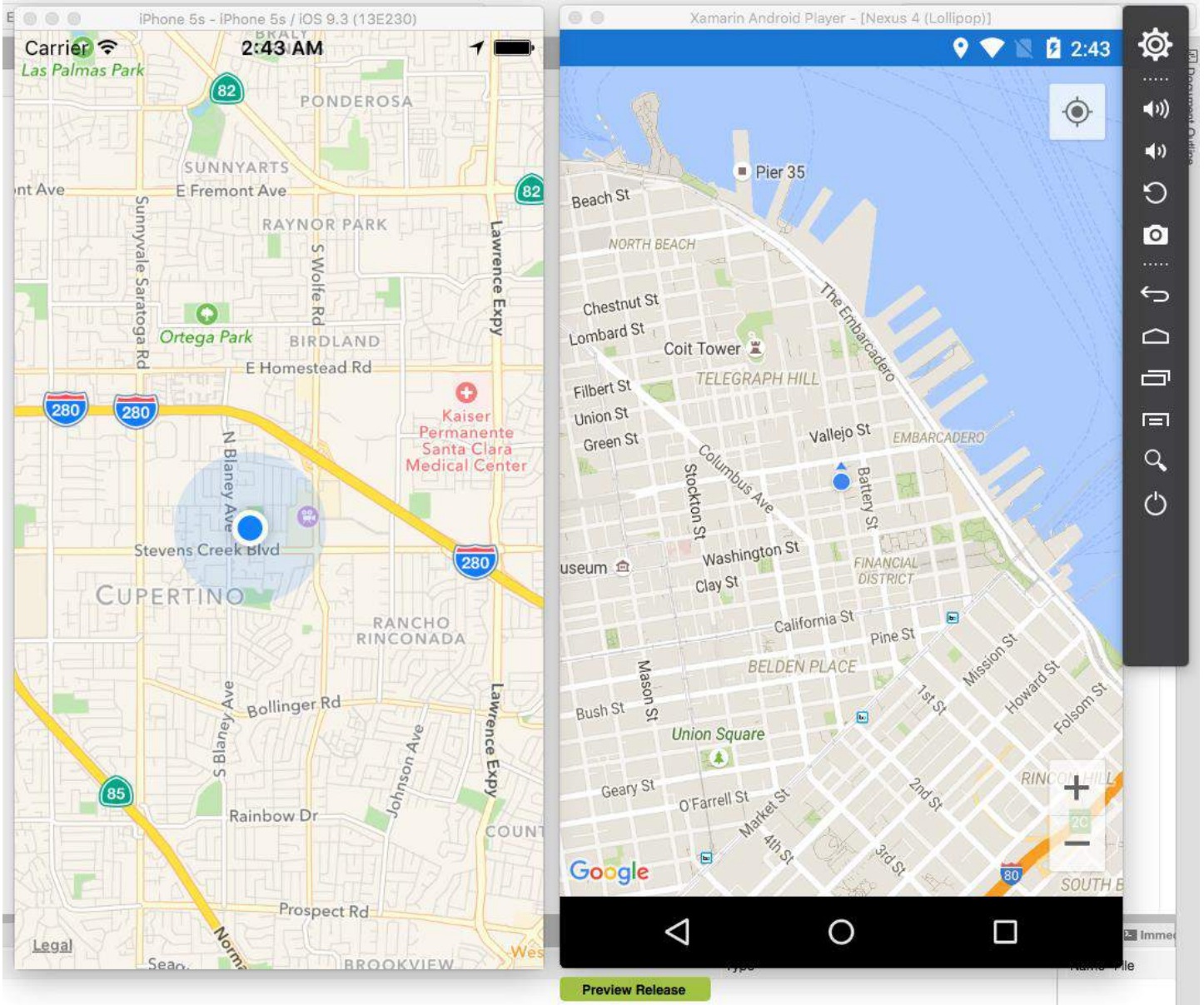
{
  public App()
  {
    var map = new Map();
    map.IsShowingUser = true;

    var rootPage = new ContentPage();
    rootPage.Content = map;

    MainPage = rootPage;
  }
}

```

That's all. Now if you'll run your app on iOS or Android, it will show you the map view:



Chapter 18: Custom Fonts in Styles

Section 18.1: Accessing custom Fonts in Syles

Xamarin.Forms provide great mechanism for styling your cross-platforms application with global styles.

In mobile world your application must be pretty and stand out from the other applications. One of this characters is Custom Fonts used in application.

With power support of XAML Styling in Xamarin.Forms just created base style for all labels with yours custom fonts.

To include custom fonts into you iOS and Android project follow the guide in [Using custom fonts on iOS and Android with Xamarin.Forms](#) post written by Gerald.

Declare Style in App.xaml file resource section. This make all styles globally visible.

From Gerald post above we need to use StyleId property but it isn't bindable property, so to using it in Style Setter we need to create Attachable Property for it:

```
public static class FontHelper
{
    public static readonly BindableProperty StyleIdProperty =
        BindableProperty.CreateAttached(
            propertyName: nameof(Label.StyleId),
            returnType: typeof(String),
            declaringType: typeof(FontHelper),
            defaultValue: default(String),
            propertyChanged: OnItemTappedChanged);

    public static String GetStyleId(BindableObject bindable) =>
        (String)bindable.GetValue(StyleIdProperty);

    public static void SetStyleId(BindableObject bindable, String value) =>
        bindable.SetValue(StyleIdProperty, value);

    public static void OnItemTappedChanged(BindableObject bindable, object oldValue, object
newValue)
    {
        var control = bindable as Element;
        if (control != null)
        {
            control.StyleId = GetStyleId(control);
        }
    }
}
```

Then add style in App.xaml resource:

```
<?xml version="1.0" encoding="utf-8" ?>
<Application xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    xmlns:h="clr-namespace:My.Helpers"
    x:Class="My.App">

    <Application.Resources>

        <ResourceDictionary>
```

```

        <Style x:Key="LabelStyle" TargetType="Label">
            <Setter Property="FontFamily" Value="Metric Bold" />
            <Setter Property="h:FontHelper.StyleId" Value="Metric-Bold" />
        </Style>
    </ResourceDictionary>

</Application.Resources>

</Application>

```

According to post above we need to create Custom Renderer for Label which inherits from LabelRenderer On Android platform.

```

internal class LabelExRenderer : LabelRenderer
{
    protected override void OnElementChanged(ElementChangedEventArgs<Label> e)
    {
        base.OnElementChanged(e);
        if (!String.IsNullOrEmpty(e.NewElement?.StyleId))
        {
            var font = Typeface.CreateFromAsset(Forms.Context.ApplicationContext.Assets,
e.NewElement.StyleId + ".ttf");
            Control.Typeface = font;
        }
    }
}

```

For iOS platform no custom renderers required.

Now you can obtain style in your `s` page markup:

For specific label

```

<Label Text="Some text" Style={StaticResource LabelStyle} />

```

Or apply style to all labels on the page by creating Style Based on LablesStyle

```

<!-- language: xaml -->

<?xml version="1.0" encoding="utf-8" ?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    x:Class="My.MainPage">

    <ContentPage.Resources>

        <ResourceDictionary>
            <Style TargetType="Label" BasedOn={StaticResource LabelStyle}>
            </Style>
        </ResourceDictionary>

    </ContentPage.Resources>

    <Label Text="Some text" />

</ContentPage>

```

Chapter 19: Push Notifications

Section 19.1: Push notifications for Android with Azure

Implementation on Android is a bit more work and requires a specific Service to be implemented.

First lets check if our device is capable of receiving push notifications, and if so, register it with Google. This can be done with this code in our MainActivity.cs file.

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

    global::Xamarin.Forms.Forms.Init(this, bundle);

    // Check to ensure everything's setup right for push
    GcmClient.CheckDevice(this);
    GcmClient.CheckManifest(this);
    GcmClient.Register(this, NotificationsBroadcastReceiver.SenderIDs);

    LoadApplication(new App());
}
```

The SenderIDs can be found in the code underneath and is the project number that you get from the Google developer dashboard in order to be able to send push messages.

```
using Android.App;
using Android.Content;
using Gcm.Client;
using Java.Lang;
using System;
using WindowsAzure.Messaging;
using XamarinNotifications.Helpers;

// These attributes are to register the right permissions for our app concerning push messages
[assembly: Permission(Name = "com.versluisit.xamarinnotifications.permission.C2D_MESSAGE")]
[assembly: UsesPermission(Name = "com.versluisit.xamarinnotifications.permission.C2D_MESSAGE")]
[assembly: UsesPermission(Name = "com.google.android.c2dm.permission.RECEIVE")]

//GET_ACCOUNTS is only needed for android versions 4.0.3 and below
[assembly: UsesPermission(Name = "android.permission.GET_ACCOUNTS")]
[assembly: UsesPermission(Name = "android.permission.INTERNET")]
[assembly: UsesPermission(Name = "android.permission.WAKE_LOCK")]

namespace XamarinNotifications.Droid.PlatformSpecifics
{
    // These attributes belong to the BroadcastReceiver, they register for the right intents
    [BroadcastReceiver(Permission = Constants.PERMISSION_GCM_INTENTS)]
    [IntentFilter(new[] { Constants.INTENT_FROM_GCM_MESSAGE },
        Categories = new[] { "com.versluisit.xamarinnotifications" })]
    [IntentFilter(new[] { Constants.INTENT_FROM_GCM_REGISTRATION_CALLBACK },
        Categories = new[] { "com.versluisit.xamarinnotifications" })]
    [IntentFilter(new[] { Constants.INTENT_FROM_GCM_LIBRARY_RETRY },
        Categories = new[] { "com.versluisit.xamarinnotifications" })]

    // This is the broadcast receiver
    public class NotificationsBroadcastReceiver : GcmBroadcastReceiverBase<PushHandlerService>
    {
        // TODO add your project number here
    }
}
```

```

    public static string[] SenderIDs = { "96688-----" };
}

[Service] // Don't forget this one! This tells Xamarin that this class is a Android Service
public class PushHandlerService : GcmServiceBase
{
    // TODO add your own access key
    private string _connectionString =
ConnectionStrings.CreateUsingSharedAccessKeyWithListenAccess(
    new Java.Net.URI("sb://xamarinnotifications-ns.servicebus.windows.net/"), "<your key
here>");

    // TODO add your own hub name
    private string _hubName = "xamarinnotifications";

    public static string RegistrationID { get; private set; }

    public PushHandlerService() : base(NotificationsBroadcastReceiver.SenderIDs)
    {
    }

    // This is the entry point for when a notification is received
    protected override void OnMessage(Context context, Intent intent)
    {
        var title = "XamarinNotifications";

        if (intent.Extras.ContainsKey("title"))
            title = intent.Extras.GetString("title");

        var messageText = intent.Extras.GetString("message");

        if (!string.IsNullOrEmpty(messageText))
            CreateNotification(title, messageText);
    }

    // The method we use to compose our notification
    private void CreateNotification(string title, string desc)
    {
        // First we make sure our app will start when the notification is pressed
        const int pendingIntentId = 0;
        const int notificationId = 0;

        var startupIntent = new Intent(this, typeof(MainActivity));
        var stackBuilder = TaskStackBuilder.Create(this);

        stackBuilder.AddParentStack(Class.FromType(typeof(MainActivity)));
        stackBuilder.AddNextIntent(startupIntent);

        var pendingIntent =
            stackBuilder.GetPendingIntent(pendingIntentId, PendingIntentFlags.OneShot);

        // Here we start building our actual notification, this has some more
        // interesting customization options!
        var builder = new Notification.Builder(this)
            .SetContentIntent(pendingIntent)
            .SetContentTitle(title)
            .SetContentText(desc)
            .SetSmallIcon(Resource.Drawable.icon);

        // Build the notification
        var notification = builder.Build();
        notification.Flags = NotificationFlags.AutoCancel;
    }
}

```

```

    // Get the notification manager
    var notificationManager =
        GetSystemService(NotificationService) as NotificationManager;

    // Publish the notification to the notification manager
    notificationManager.Notify(notificationId, notification);
}

// Whenever an error occurs in regard to push registering, this fires
protected override void OnError(Context context, string errorId)
{
    Console.Out.WriteLine(errorId);
}

// This handles the successful registration of our device to Google
// We need to register with Azure here ourselves
protected override void OnRegistered(Context context, string registrationId)
{
    var hub = new NotificationHub(_hubName, _connectionString, context);

    Settings.DeviceToken = registrationId;

    // TODO set some tags here if you want and supply them to the Register method
    var tags = new string[] { };

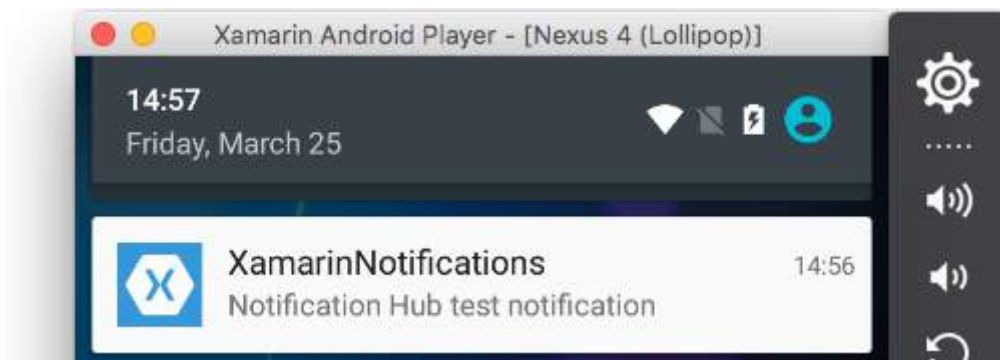
    hub.Register(registrationId, tags);
}

// This handles when our device unregisters at Google
// We need to unregister with Azure
protected override void OnUnRegistered(Context context, string registrationId)
{
    var hub = new NotificationHub(_hubName, _connectionString, context);

    hub.UnregisterAll(registrationId);
}
}
}

```

A sample notification on Android looks like this.



Section 19.2: Push notifications for iOS with Azure

To start the registration for push notifications you need to execute the below code.

```

// registers for push
var settings = UIUserNotificationSettings.GetSettingsForTypes(
    UIUserNotificationType.Alert
    | UIUserNotificationType.Badge

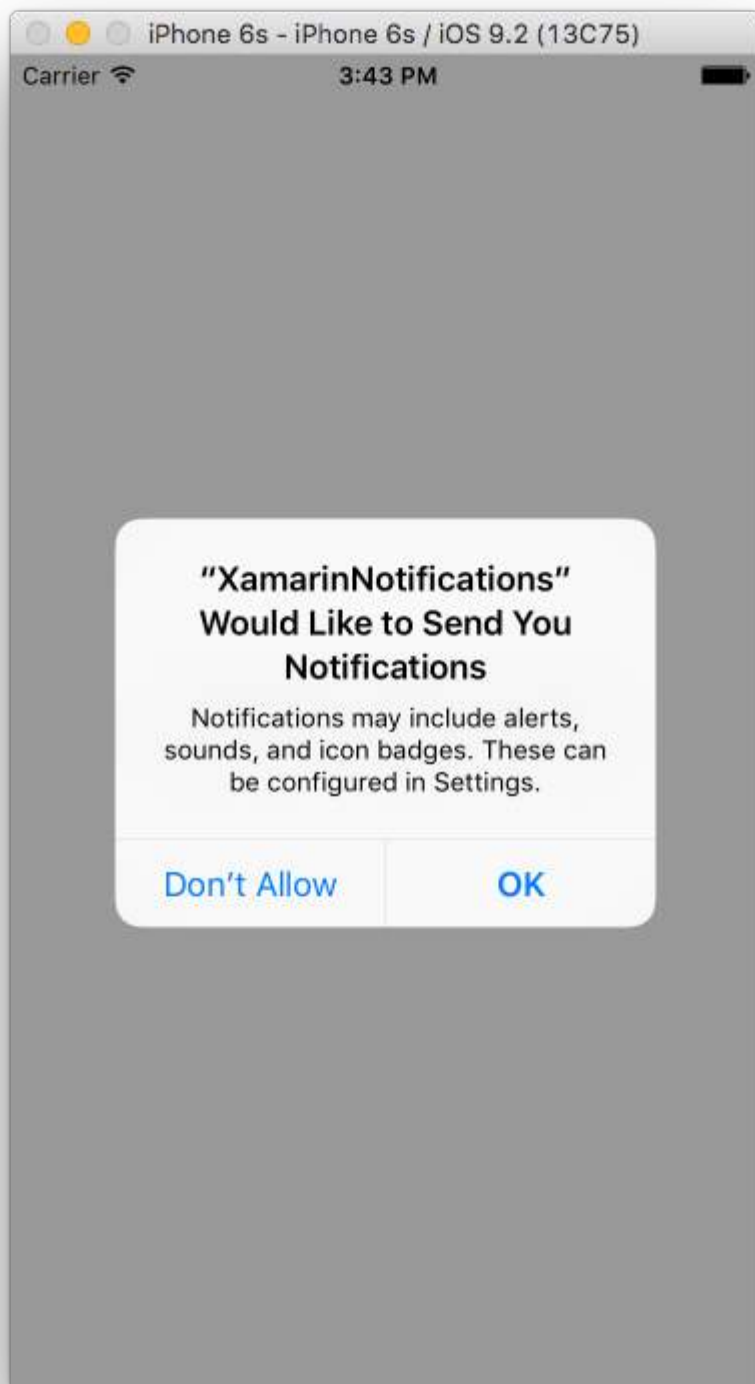
```

```
| UIApplicationType.Sound,  
new NSSet());
```

```
UIApplication.SharedApplication.RegisterUserNotificationSettings(settings);  
UIApplication.SharedApplication.RegisterForRemoteNotifications();
```

This code can either be ran directly when the app starts up in the FinishedLaunching in the AppDelegate.cs file. Or you can do it whenever a user decides that they want to enable push notifications.

Running this code will trigger an alert to prompt the user if they will accept that the app can send them notifications. So also implement a scenario where the user denies that!



These are the events that need implementation for implementing push notifications on iOS. You can find them in the AppDelegate.cs file.

```
// We've successfully registered with the Apple notification service, or in our case Azure
public override void RegisteredForRemoteNotifications(UIApplication application, NSData
deviceToken)
{
    // Modify device token for compatibility Azure
    var token = deviceToken.Description;
    token = token.Trim('<', '>').Replace(" ", "");

    // You need the Settings plugin for this!
    Settings.DeviceToken = token;

    var hub = new SBNotificationHub("Endpoint=sb://xamarinnotifications-
ns.servicebus.windows.net/;SharedAccessKeyName=DefaultListenSharedAccessSignature;SharedAccessKey=<
your own key>", "xamarinnotifications");

    NSSet tags = null; // create tags if you want, not covered for now
    hub.RegisterNativeAsync(deviceToken, tags, (errorCallback) =>
    {
        if (errorCallback != null)
        {
            var alert = new UIAlertView("ERROR!", errorCallback.ToString(), null, "OK", null);
            alert.Show();
        }
    });
}

// We've received a notification, yay!
public override void ReceivedRemoteNotification(UIApplication application, NSDictionary userInfo)
{
    NSObject inAppMessage;

    var success = userInfo.TryGetValue(new NSString("inAppMessage"), out inAppMessage);

    if (success)
    {
        var alert = new UIAlertView("Notification!", inAppMessage.ToString(), null, "OK", null);
        alert.Show();
    }
}

// Something went wrong while registering!
public override void FailedToRegisterForRemoteNotifications(UIApplication application, NSError
error)
{
    var alert = new UIAlertView("Computer says no", "Notification registration failed! Try again!",
null, "OK", null);

    alert.Show();
}
```

When a notification is received this is what it looks like.



XamarinNotifications nu Notification Hub test notification

XamarinNo...

Section 19.3: iOS Example

1. You will need a development device
2. Go to your Apple Developer Account and create a provisioning profile with Push Notifications enabled
3. You will need some sort of way to notify your phone (AWS, Azure..etc) **We will use AWS here**

```
public override bool FinishedLaunching(UIApplication app, NSDictionary options)
{
    global::Xamarin.Forms.Forms.Init();

    //after typical Xamarin.Forms Init Stuff

    //variable to set-up the style of notifications you want, iOS supports 3 types

    var pushSettings = UIUserNotificationSettings.GetSettingsForTypes(
        UIUserNotificationType.Alert |
        UIUserNotificationType.Badge |
        UIUserNotificationType.Sound,
        null );

    //both of these methods are in iOS, we have to override them and set them up
    //to allow push notifications

    app.RegisterUserNotificationSettings(pushSettings); //pass the supported push
notifications settings to register app in settings page
}

public override async void RegisteredForRemoteNotifications(UIApplication application, NSData
token)
{
    AmazonSimpleNotificationServiceClient snsClient = new
AmazonSimpleNotificationServiceClient("your AWS credentials here");

    // This contains the registered push notification token stored on the phone.
    var deviceToken = token.Description.Replace("<", "").Replace(">", "").Replace(" ", "");

    if (!string.IsNullOrEmpty(deviceToken))
    {

```



```

//register with SNS to create an endpoint ARN, this means AWS can message your phone
var response = await snsClient.CreatePlatformEndpointAsync(
new CreatePlatformEndpointRequest
{
    Token = deviceToken,
    PlatformApplicationArn = "yourARNwouldgohere" /* insert your platform application
ARN here */
});

var endpoint = response.EndpointArn;

//AWS lets you create topics, so use subscribe your app to a topic, so you can easily
send out one push notification to all of your users
var subscribeResponse = await snsClient.SubscribeAsync(new SubscribeRequest
{
    TopicArn = "YourTopicARN here",
    Endpoint = endpoint,
    Protocol = "application"
});
}
}
}

```

Chapter 20: Effects

Effects simplifies platform specific customizations. When there is a need to modify a Xamarin Forms Control's properties, Effects can be used. When there is a need to override the Xamarin Forms Control's methods, Custom renderers can be used

Section 20.1: Adding platform specific Effect for an Entry control

1. Create a new Xamarin Forms app using PCL File -> New Solution -> Multiplatform App -> Xamarin Forms -> Forms App; Name the project as EffectsDemo
2. Under the iOS project, add a new Effect class that inherits from PlatformEffect class and overrides the methods OnAttached, OnDetached and OnElementPropertyChanged Notice the two attributes ResolutionGroupName and ExportEffect, these are required for consuming this effect from the PCL/shared project.
 - OnAttached is the method where the logic for customization goes in
 - OnDetached is the method where the clean up and de-registering happens
 - OnElementPropertyChanged is the method which gets triggered upon property changes of different elements. To identify the right property, check for the exact property change and add your logic. In this example, OnFocus will give the Blue color and OutofFocus will give Red Color

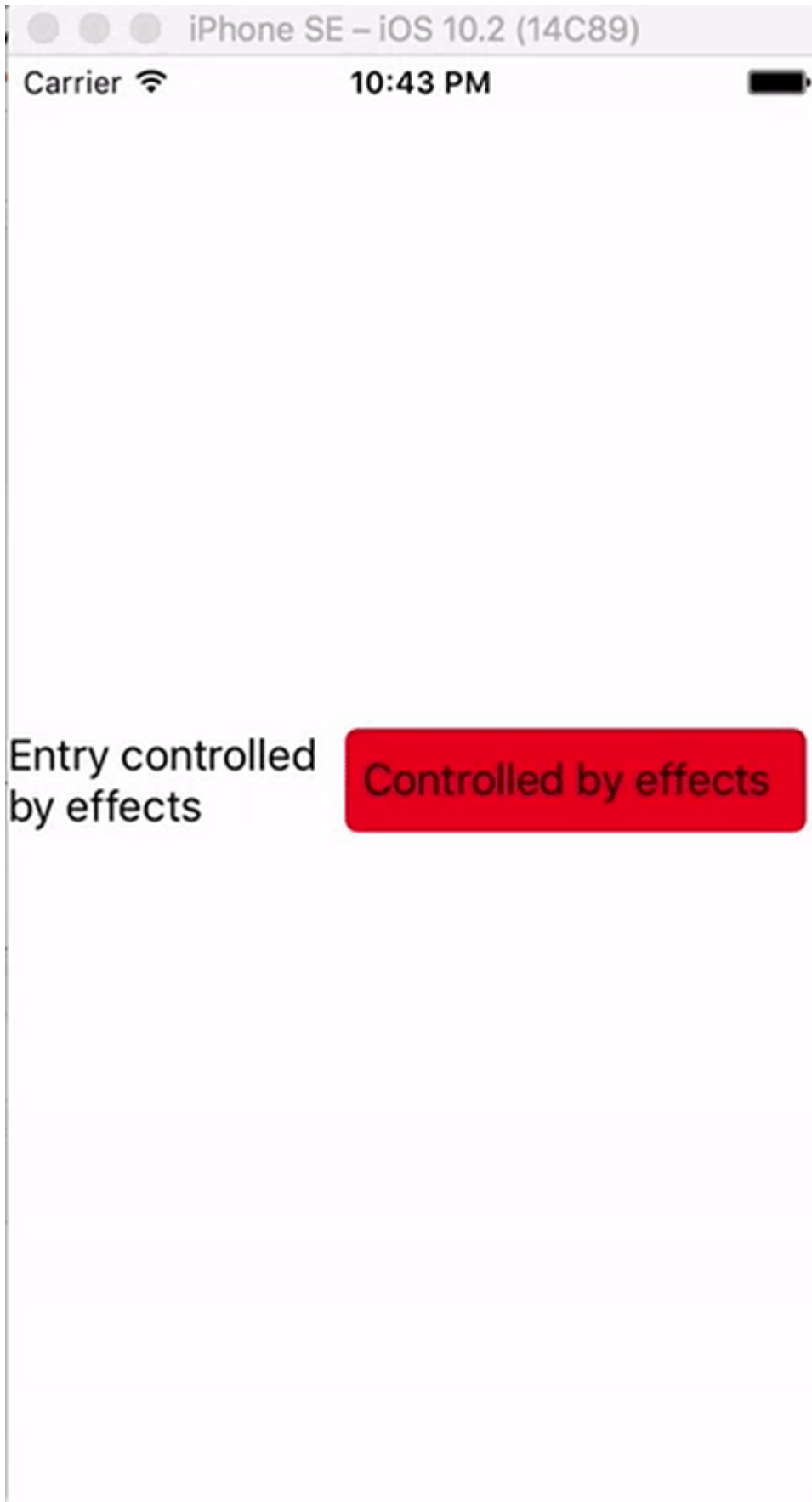
```
using System;
using EffectsDemo.iOS;
using UIKit;
using Xamarin.Forms;
using Xamarin.Forms.Platform.iOS;

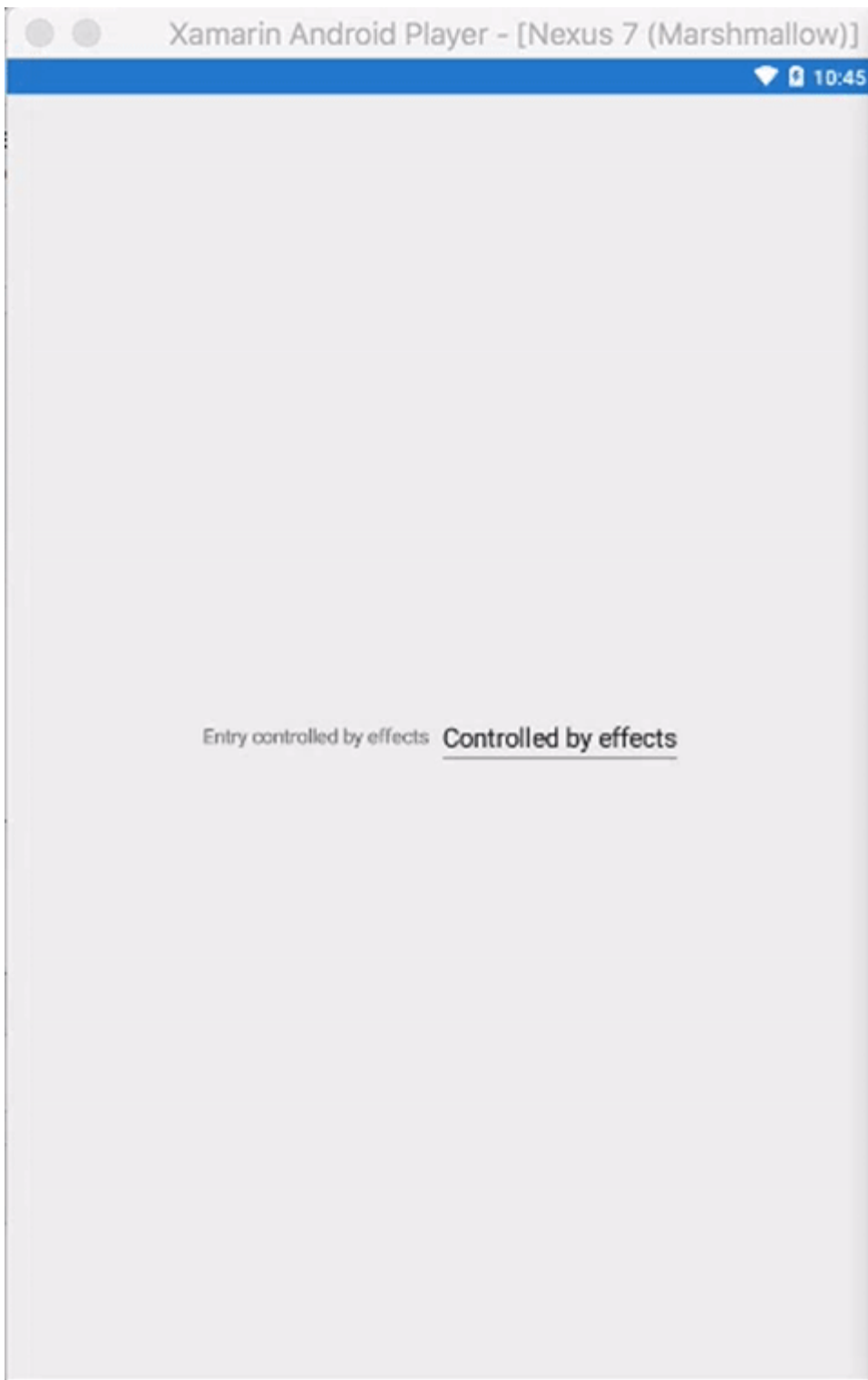
[assembly: ResolutionGroupName("xhackers")]
[assembly: ExportEffect(typeof(FocusEffect), "FocusEffect")]
namespace EffectsDemo.iOS
{
    public class FocusEffect : PlatformEffect
    {
        public FocusEffect()
        {
        }
        UIColor backgroundColor;
        protected override void OnAttached()
        {
            try
            {
                Control.BackgroundColor = backgroundColor = UIColor.Red;
            }
            catch (Exception ex)
            {
                Console.WriteLine("Cannot set attacked property" + ex.Message);
            }
        }

        protected override void OnDetached()
        {
            throw new NotImplementedException();
        }
    }
}
```



```
</StackLayout>  
</ContentPage>
```





Since the Effect was implemented only in iOS version, when the app runs in iOS Simulator upon focusing the Entry background color changes and nothing happens in Android Emulator as the Effect wasn't created under Droid project

Chapter 21: Triggers & Behaviours

Section 21.1: Xamarin Forms Trigger Example

Triggers are an easy way to add some UX responsiveness to your application. One easy way to do this is to add a Trigger which changes a Label's TextColor based on whether its related Entry has text entered into it or not.

Using a Trigger for this allows the Label.TextColor to change from gray (when no text is entered) to black (as soon as the users enters text):

Converter (each converter is given an Instance variable which is used in the binding so that a new instance of the class is not created each time it is used):

```
/// <summary>
/// Used in a XAML trigger to return <c>>true</c> or <c>>false</c> based on the length of <c>value</c>.
/// </summary>
public class LengthTriggerConverter : Xamarin.Forms.IValueConverter {

    /// <summary>
    /// Used so that a new instance is not created every time this converter is used in the XAML
    code.
    /// </summary>
    public static LengthTriggerConverter Instance = new LengthTriggerConverter();

    /// <summary>
    /// If a `ConverterParameter` is passed in, a check to see if <c>value</c> is greater than
    <c>parameter</c> is made. Otherwise, a check to see if <c>value</c> is over 0 is made.
    /// </summary>
    /// <param name="value">The length of the text from an Entry/Label/etc.</param>
    /// <param name="targetType">The Type of object/control that the text/value is coming
    from.</param>
    /// <param name="parameter">Optional, specify what length to test against (example: for 3 Letter
    Name, we would choose 2, since the 3 Letter Name Entry needs to be over 2 characters), if not
    specified, defaults to 0.</param>
    /// <param name="culture">The current culture set in the device.</param>
    /// <returns><c>object</c>, which is a <c>bool</c> (<c>true</c> if <c>value</c> is greater than 0
    (or is greater than the parameter), <c>>false</c> if not).</returns>
    public object Convert(object value, System.Type targetType, object parameter, CultureInfo
    culture) { return DoWork(value, parameter); }
    public object ConvertBack(object value, System.Type targetType, object parameter, CultureInfo
    culture) { return DoWork(value, parameter); }

    private static object DoWork(object value, object parameter) {
        int parameterInt = 0;

        if(parameter != null) { //If param was specified, convert and use it, otherwise, 0 is used

            string parameterString = (string)parameter;

            if(!string.IsNullOrEmpty(parameterString)) { int.TryParse(parameterString, out
            parameterInt); }

            return (int)value > parameterInt;
        }
    }
}
```

XAML (the XAML code uses the x:Name of the Entry to figure out in the Entry.Text property is over 3 characters

long.):

```
<StackLayout>
  <Label Text="3 Letter Name">
    <Label.Triggers>
      <DataTrigger TargetType="Label"
        Binding="{Binding Source={x:Reference NameEntry},
          Path=Text.Length,
          Converter={x:Static
helpers:LengthTriggerConverter.Instance},
          ConverterParameter=2}"
        Value="False">
        <Setter Property="TextColor"
          Value="Gray"/>
      </DataTrigger>
    </Label.Triggers>
  </Label>
  <Entry x:Name="NameEntry"
    Text="{Binding MealAmount}"
    HorizontalOptions="StartAndExpand"/>
</StackLayout>
```

Section 21.2: Multi Triggers

MultiTrigger is not needed frequently but there are some situations where it is very handy. MultiTrigger behaves similarly to Trigger or DataTrigger but it has multiple conditions. All the conditions must be true for a Setters to fire. Here is a simple example:

```
<!-- Text field needs to be initialized in order for the trigger to work at start -->
<Entry x:Name="email" Placeholder="Email" Text="" />
<Entry x:Name="phone" Placeholder="Phone" Text="" />
<Button Text="Submit">
  <Button.Triggers>
    <MultiTrigger TargetType="Button">
      <MultiTrigger.Conditions>
        <BindingCondition Binding="{Binding Source={x:Reference email}, Path=Text.Length}"
Value="0" />
        <BindingCondition Binding="{Binding Source={x:Reference phone}, Path=Text.Length}"
Value="0" />
      </MultiTrigger.Conditions>
      <Setter Property="IsEnabled" Value="False" />
    </MultiTrigger>
  </Button.Triggers>
</Button>
```

The example has two different entries, phone and email, and one of them is required to be filled. The MultiTrigger disables the submit button when both fields are empty.

Chapter 22: AppSettings Reader in Xamarin.Forms

Section 22.1: Reading app.config file in a Xamarin.Forms Xaml project

While each mobile platforms do offer their own settings management api, there are no built in ways to read settings from a good old .net style app.config xml file; This is due to a bunch of good reasons, notably the .net framework configuration management api being on the heavyweight side, and each platform having their own file system api.

So we built a simple [PCLAppConfig](#) library, nicely nuget packaged for your immediate consumption.

This library makes use of the lovely [PCLStorage](#) library

This example assumes you are developing a Xamarin.Forms Xaml project, where you would need to access settings from your shared viewmodel.

1. Initialize `ConfigurationManager.AppSettings` on each of your platform project, just after the 'Xamarin.Forms.Forms.Init' statement, as per below:

iOS (AppDelegate.cs)

```
global::Xamarin.Forms.Forms.Init();
ConfigurationManager.Initialise(PCLAppConfig.FileSystemStream.PortableStream.Current);
LoadApplication(new App());
```

Android (MainActivity.cs)

```
global::Xamarin.Forms.Forms.Init(this, bundle);
ConfigurationManager.Initialise(PCLAppConfig.FileSystemStream.PortableStream.Current);
LoadApplication(new App());
```

UWP / Windows 8.1 / WP 8.1 (App.xaml.cs)

```
Xamarin.Forms.Forms.Init(e);
ConfigurationManager.Initialise(PCLAppConfig.FileSystemStream.PortableStream.Current);
```

2. Add an app.config file to your shared PCL project, and add your appSettings entries, as you would do with any app.config file

```
<configuration>
  <appSettings>
    <add key="config.text" value="hello from app.settings!" />
  </appSettings>
</configuration>
```

3. Add this PCL app.config file **as a linked file** on all your platform projects. For android, make sure to set the build action to '**AndroidAsset**', for UWP set the build action to '**Content**'
4. Access your setting: `ConfigurationManager.AppSettings["config.text"]`;

Chapter 23: Creating custom controls

Every `Xamarin.Forms` view has an accompanying renderer for each platform that creates an instance of a native control. When a View is rendered on the specific platform the `ViewRenderer` class is instantiated.

The process for doing this is as follows:

Create a `Xamarin.Forms` custom control.

Consume the custom control from `Xamarin.Forms`.

Create the custom renderer for the control on each platform.

Section 23.1: Label with bindable collection of Spans

I created custom label with wrapper around `FormattedText` property:

```
public class MultiComponentLabel : Label
{
    public IList<TextComponent> Components { get; set; }

    public MultiComponentLabel()
    {
        var components = new ObservableCollection<TextComponent>();
        components.CollectionChanged += OnComponentsChanged;
        Components = components;
    }

    private void OnComponentsChanged(object sender, NotifyCollectionChangedEventArgs e)
    {
        BuildText();
    }

    private void OnComponentPropertyChanged(object sender,
        System.ComponentModel.PropertyChangedEventArgs e)
    {
        BuildText();
    }

    private void BuildText()
    {
        var formattedString = new FormattedString();
        foreach (var component in Components)
        {
            formattedString.Spans.Add(new Span { Text = component.Text });
            component.PropertyChanged -= OnComponentPropertyChanged;
            component.PropertyChanged += OnComponentPropertyChanged;
        }

        FormattedText = formattedString;
    }
}
```

I added collection of custom `TextComponents`:

```
public class TextComponent : BindableObject
{
    public static readonly BindableProperty TextProperty =
```

```

        BindableProperty.Create(nameof(Text),
                                typeof(string),
                                typeof(TextComponent),
                                default(string));

    public string Text
    {
        get { return (string)GetValue(TextProperty); }
        set { SetValue(TextProperty, value); }
    }
}

```

And when collection of text components changes or Text property of separate component changes I rebuild FormattedText property of base Label.

And how I used it in XAML:

```

<ContentPage x:Name="Page"
    xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    xmlns:controls="clr-namespace:SuperForms.Controls;assembly=SuperForms.Controls"
    x:Class="SuperForms.Samples.MultiComponentLabelPage">
<controls:MultiComponentLabel Margin="0,20,0,0">
    <controls:MultiComponentLabel.Components>
        <controls:TextComponent Text="Time"/>
        <controls:TextComponent Text=":" />
        <controls:TextComponent Text="{Binding CurrentTime, Source={x:Reference Page}}"/>
    </controls:MultiComponentLabel.Components>
</controls:MultiComponentLabel>
</ContentPage>

```

Codebehind of page:

```

public partial class MultiComponentLabelPage : ContentPage
{
    private string _currentTime;

    public string CurrentTime
    {
        get { return _currentTime; }
        set
        {
            _currentTime = value;
            OnPropertyChanged();
        }
    }

    public MultiComponentLabelPage()
    {
        InitializeComponent();
        BindingContext = this;
    }

    protected override void OnAppearing()
    {
        base.OnAppearing();

        Device.StartTimer(TimeSpan.FromSeconds(1), () =>
        {
            CurrentTime = DateTime.Now.ToString("hh : mm : ss");
        }
    }
}

```

```

        return true;
    });
}
}

```

Section 23.2: Implementing a CheckBox Control

In this example we will implement a custom Checkbox for Android and iOS.

Creating the Custom Control

```

namespace CheckBoxCustomRenderExample
{
    public class Checkbox : View
    {
        public static readonly BindableProperty IsCheckedProperty =
BindableProperty.Create<Checkbox, bool>(p => p.IsChecked, true, propertyChanged: (s, o, n) => { (s
as Checkbox).OnChecked(new EventArgs()); });
        public static readonly BindableProperty ColorProperty = BindableProperty.Create<Checkbox,
Color>(p => p.Color, Color.Default);

        public bool IsChecked
        {
            get
            {
                return (bool)GetValue(IsCheckedProperty);
            }
            set
            {
                SetValue(IsCheckedProperty, value);
            }
        }

        public Color Color
        {
            get
            {
                return (Color)GetValue(ColorProperty);
            }
            set
            {
                SetValue(ColorProperty, value);
            }
        }

        public event EventHandler Checked;

        protected virtual void OnChecked(EventArgs e)
        {
            if (Checked != null)
                Checked(this, e);
        }
    }
}

```

We'll start off with the Android Custom Renderer by creating a new class (CheckboxCustomRenderer) in the Android portion of our solution.

A few important details to note:

- We need to mark the top of our class with the ExportRenderer attribute so that the renderer is registered

with `Xamarin.Forms`. This way, `Xamarin.Forms` will use this renderer when it's trying to create our `CheckBox` object on Android.

- We're doing most of our work in the `OnElementChanged` method, where we instantiate and set up our native control.

Consuming the Custom Control

```
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml" xmlns:local="clr-
namespace:CheckBoxCustomRendererExample"
x:Class="CheckBoxCustomRendererExample.CheckBoxCustomRendererExamplePage">
    <StackLayout Padding="20">
        <local:CheckBox Color="Aqua" />
    </StackLayout>
</ContentPage>
```

Creating the Custom Renderer on each Platform

The process for creating the custom renderer class is as follows:

1. Create a subclass of the `ViewRenderer<T1, T2>` class that renders the custom control. The first type argument should be the custom control the renderer is for, in this case `CheckBox`. The second type argument should be the native control that will implement the custom control.
2. Override the `OnElementChanged` method that renders the custom control and write logic to customize it. This method is called when the corresponding `Xamarin.Forms` control is created.
3. Add an `ExportRenderer` attribute to the custom renderer class to specify that it will be used to render the `Xamarin.Forms` custom control. This attribute is used to register the custom renderer with `Xamarin.Forms`.

Creating the Custom Renderer for Android

```
[assembly: ExportRenderer(typeof(Checkbox), typeof(CheckBoxRenderer))]
namespace CheckBoxCustomRendererExample.Droid
{
    public class CheckBoxRenderer : ViewRenderer<Checkbox, CheckBox>
    {
        private CheckBox checkBox;

        protected override void OnElementChanged(ElementChangedEventArgs<Checkbox> e)
        {
            base.OnElementChanged(e);
            var model = e.NewElement;
            checkBox = new CheckBox(Context);
            checkBox.Tag = this;
            CheckboxPropertyChanged(model, null);
            checkBox.SetOnClickListener(new ClickListener(model));
            SetNativeControl(checkBox);
        }
        private void CheckboxPropertyChanged(Checkbox model, String propertyName)
        {
            if (propertyName == null || Checkbox.IsCheckedProperty.PropertyName == propertyName)
            {
                checkBox.Checked = model.IsChecked;
            }

            if (propertyName == null || Checkbox.ColorProperty.PropertyName == propertyName)
            {
                int[][] states = {
                    new int[] { Android.Resource.Attribute.StateEnabled}, // enabled
                    new int[] {Android.Resource.Attribute.StateEnabled}, // disabled
                    new int[] {Android.Resource.Attribute.StateChecked}, // unchecked
                };
            }
        }
    }
}
```



```

public CheckBoxView(CGRect bounds)
    : base(bounds)
{
    Initialize();
}

public string CheckedTitle
{
    set
    {
        SetTitle(value, UIControlState.Selected);
    }
}

public string UncheckedTitle
{
    set
    {
        SetTitle(value, UIControlState.Normal);
    }
}

public bool Checked
{
    set { Selected = value; }
    get { return Selected; }
}

void Initialize()
{
    ApplyStyle();

    TouchUpInside += (sender, args) => Selected = !Selected;
    // set default color, because type is not UIButtonType.System
    SetTitleColor(UIColor.DarkTextColor, UIControlState.Normal);
    SetTitleColor(UIColor.DarkTextColor, UIControlState.Selected);
}

void ApplyStyle()
{
    SetImage(UIImage.FromBundle("Images/checked_checkbox.png"), UIControlState.Selected);
    SetImage(UIImage.FromBundle("Images/unchecked_checkbox.png"), UIControlState.Normal);
}
}
}

```

The CheckBox custom renderer:

```

[assembly: ExportRenderer(typeof(Checkbox), typeof(CheckBoxRenderer))]
namespace CheckBoxCustomRenderExample.iOS
{
    public class CheckBoxRenderer : ViewRenderer<Checkbox, CheckBoxView>
    {
        /// <summary>
        /// Handles the Element Changed event
        /// </summary>
        /// <param name="e">The e.</param>
        protected override void OnElementChanged(ElementChangedEventArgs<Checkbox> e)
        {
            base.OnElementChanged(e);
        }
    }
}

```

```

        if (Element == null)
            return;

        BackgroundColor = Element.BackgroundColor.ToUIColor();
        if (e.NewElement != null)
        {
            if (Control == null)
            {
                var checkBox = new CheckBoxView(Bounds);
                checkBox.TouchUpInside += (s, args) => Element.IsChecked = Control.Checked;
                SetNativeControl(checkBox);
            }
            Control.Checked = e.NewElement.IsChecked;
        }

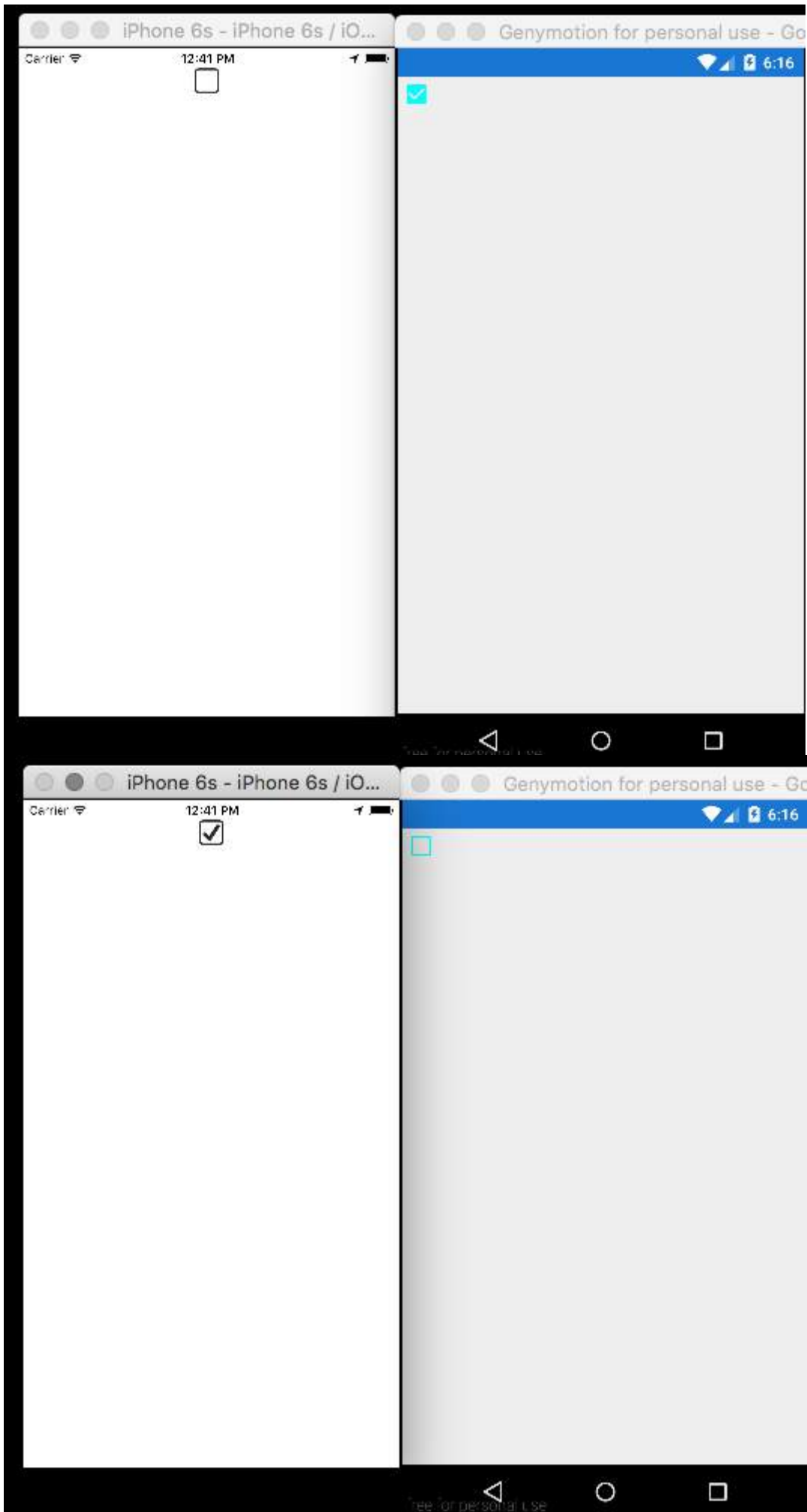
        Control.Frame = Frame;
        Control.Bounds = Bounds;
    }

    /// <summary>
    /// Handles the <see cref="E:ElementPropertyChanged" /> event.
    /// </summary>
    /// <param name="sender">The sender.</param>
    /// <param name="e">The <see cref="PropertyChangedEventArgs"/> instance containing the event
    data.</param>
    protected override void OnElementPropertyChanged(object sender, PropertyChangedEventArgs e)
    {
        base.OnElementPropertyChanged(sender, e);

        if (e.PropertyName.Equals("Checked"))
        {
            Control.Checked = Element.IsChecked;
        }
    }
}

```

Result:



Section 23.3: Create an Xamarin Forms custom input control (no native required)

Below is an example of a pure Xamarin Forms custom control. No custom rendering is being done for this but could easily be implemented, in fact, in my own code, I use this very same control along with a custom renderer for both the Label and Entry.

The custom control is a ContentView with a Label, Entry, and a BoxView within it, held in place using 2 StackLayouts. We also define multiple bindable properties as well as a TextChanged event.

The custom bindable properties work by being defined as they are below and having the elements within the control (in this case a Label and an Entry) being bound to the custom bindable properties. A few on the bindable properties need to also implement a BindingPropertyChangedDelegate in order to make the bounded elements change their values.

```
public class InputFieldContentView : ContentView {

    #region Properties

    /// <summary>
    /// Attached to the <c>InputFieldContentView</c>'s <c>ExtendedEntryOnTextChanged()</c> event, but
    /// returns the <c>sender</c> as <c>InputFieldContentView</c>.
    /// </summary>
    public event System.EventHandler<TextChangedEventArgs> OnContentViewTextChangedEvent; //In
    OnContentViewTextChangedEvent() we return our custom InputFieldContentView control as the sender but
    we could have returned the Entry itself as the sender if we wanted to do that instead.

    public static readonly BindableProperty LabelTextProperty =
    BindableProperty.Create("LabelText", typeof(string), typeof(InputFieldContentView), string.Empty);

    public string LabelText {
        get { return (string)GetValue(LabelTextProperty); }
        set { SetValue(LabelTextProperty, value); }
    }

    public static readonly BindableProperty LabelColorProperty =
    BindableProperty.Create("LabelColor", typeof(Color), typeof(InputFieldContentView), Color.Default);

    public Color LabelColor {
        get { return (Color)GetValue(LabelColorProperty); }
        set { SetValue(LabelColorProperty, value); }
    }

    public static readonly BindableProperty EntryTextProperty =
    BindableProperty.Create("EntryText", typeof(string), typeof(InputFieldContentView), string.Empty,
    BindingMode.TwoWay, null, OnEntryTextChanged);

    public string EntryText {
        get { return (string)GetValue(EntryTextProperty); }
        set { SetValue(EntryTextProperty, value); }
    }

    public static readonly BindableProperty PlaceholderTextProperty =
    BindableProperty.Create("PlaceholderText", typeof(string), typeof(InputFieldContentView),
    string.Empty);

    public string PlaceholderText {
        get { return (string)GetValue(PlaceholderTextProperty); }
        set { SetValue(PlaceholderTextProperty, value); }
    }
}
```

```

}

public static readonly BindableProperty UnderlineColorProperty =
BindableProperty.Create("UnderlineColor", typeof(Color), typeof(InputFieldContentView),
Color.Black, BindingMode.TwoWay, null, UnderlineColorChanged);

public Color UnderlineColor {
    get { return (Color)GetValue(UnderlineColorProperty); }
    set { SetValue(UnderlineColorProperty, value); }
}

private BoxView _underline;

#endregion

public InputFieldContentView() {

    BackgroundColor = Color.Transparent;
    HorizontalOptions = LayoutOptions.FillAndExpand;

    Label label = new Label {
        BindingContext = this,
        HorizontalOptions = LayoutOptions.StartAndExpand,
        VerticalOptions = LayoutOptions.Center,
        TextColor = Color.Black
    };

    label.SetBinding(Label.TextProperty, (InputFieldContentView view) => view.LabelText,
BindingMode.TwoWay);
    label.SetBinding(Label.TextColorProperty, (InputFieldContentView view) => view.LabelColor,
BindingMode.TwoWay);

    Entry entry = new Entry {
        BindingContext = this,
        HorizontalOptions = LayoutOptions.End,
        TextColor = Color.Black,
        HorizontalTextAlignment = TextAlignment.End
    };

    entry.SetBinding(Entry.PlaceholderProperty, (InputFieldContentView view) =>
view.PlaceholderText, BindingMode.TwoWay);
    entry.SetBinding(Entry.TextProperty, (InputFieldContentView view) => view.EntryText,
BindingMode.TwoWay);

    entry.TextChanged += OnTextChangedEvent;

    _underline = new BoxView {
        BackgroundColor = Color.Black,
        HeightRequest = 1,
        HorizontalOptions = LayoutOptions.FillAndExpand
    };

    Content = new StackLayout {
        Spacing = 0,
        HorizontalOptions = LayoutOptions.FillAndExpand,
        Children = {
            new StackLayout {
                Padding = new Thickness(5, 0),
                Spacing = 0,
                HorizontalOptions = LayoutOptions.FillAndExpand,
                Orientation = StackOrientation.Horizontal,
                Children = { label, entry }
            }
        }
    }
}

```

```

        }, _underline
    }
};

SizeChanged += (sender, args) => entry.WidthRequest = Width * 0.5 - 10;
}

private static void OnEntryTextChanged(BindableObject bindable, object oldValue, object
newValue) {
    InputFieldContentView contentView = (InputFieldContentView)bindable;
    contentView.EntryText = (string)newValue;
}

private void OnTextChangedEvent(object sender, TextChangedEventArgs args) {
    if(OnContentViewTextChangedEvent != null) { OnContentViewTextChangedEvent(this, new
TextChangedEventArgs(args.OldTextValue, args.NewTextValue)); } //Here is where we pass in 'this'
(which is the InputFieldContentView) instead of 'sender' (which is the Entry control)
}

private static void UnderlineColorChanged(BindableObject bindable, object oldValue, object
newValue) {
    InputFieldContentView contentView = (InputFieldContentView)bindable;
    contentView._underline.BackgroundColor = (Color)newValue;
}
}
}

```

And here is a picture of the final product on iOS (the image shows what it looks like when using a custom renderer for the Label and Entry which is being used to remove the border on iOS and to specify a custom font for both

Name

Required

elements):

One issue I ran into was getting the `BoxView.BackgroundColor` to change when `UnderlineColor` changed. Even after binding the `BoxView's BackgroundColor` property, it would not change until I added the `UnderlineColorChanged` delegate.

Section 23.4: Creating a custom Entry control with a MaxLength property

The Xamarin Forms Entry control does not have a `MaxLength` property. To achieve this you can extend `Entry` as below, by adding a `Bindable MaxLength` property. Then you just need to subscribe to the `TextChanged` event on `Entry` and validate the length of the `Text` when this is called:

```

class CustomEntry : Entry
{
    public CustomEntry()
    {
        base.TextChanged += Validate;
    }

    public static readonly BindableProperty MaxLengthProperty =
BindableProperty.Create(nameof(MaxLength), typeof(int), typeof(CustomEntry), 0);

    public int MaxLength
    {
        get { return (int)GetValue(MaxLengthProperty); }
        set { SetValue(MaxLengthProperty, value); }
    }
}

```

```

public void Validate(object sender, TextChangedEventArgs args)
{
    var e = sender as Entry;
    var val = e?.Text;

    if (string.IsNullOrEmpty(val))
        return;

    if (MaxLength > 0 && val.Length > MaxLength)
        val = val.Remove(val.Length - 1);

    e.Text = val;
}
}

```

Usage in XAML:

```

<ContentView xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
    xmlns:customControls="clr-namespace:CustomControls;assembly=CustomControls"
    x:Class="Views.TestView">
<ContentView.Content>
    <customControls:CustomEntry MaxLength="10" />
</ContentView.Content>

```

Section 23.5: Creating custom Button

```

/// <summary>
/// Button with some additional options
/// </summary>
public class TurboButton : Button
{
    public static readonly BindableProperty StringDataProperty = BindableProperty.Create(
        propertyName: "StringData",
        returnType: typeof(string),
        declaringType: typeof(ButtonWithStorage),
        defaultValue: default(string));

    public static readonly BindableProperty IntDataProperty = BindableProperty.Create(
        propertyName: "IntData",
        returnType: typeof(int),
        declaringType: typeof(ButtonWithStorage),
        defaultValue: default(int));

    /// <summary>
    /// You can put here some string data
    /// </summary>
    public string StringData
    {
        get { return (string)GetValue(StringDataProperty); }
        set { SetValue(StringDataProperty, value); }
    }

    /// <summary>
    /// You can put here some int data
    /// </summary>
    public int IntData
    {
        get { return (int)GetValue(IntDataProperty); }
    }
}

```

```

        set { SetValue(IntDataProperty, value); }
    }

    public TurboButton()
    {
        PropertyChanged += CheckIfPropertyLoaded;
    }

    /// <summary>
    /// Called when one of properties is changed
    /// </summary>
    private void CheckIfPropertyLoaded(object sender, PropertyChangedEventArgs e)
    {
        //example of using PropertyChanged
        if(e.PropertyName == "IntData")
        {
            //IntData is now changed, you can operate on updated value
        }
    }
}

```

Usage in XAML:

```

<?xml version="1.0" encoding="utf-8" ?>
<ContentPage
    xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml"
        x:Class="SomeApp.Pages.SomeFolder.Example"
    xmlns:customControls="clr-namespace:SomeApp.CustomControls;assembly=SomeApp">
    <StackLayout>
        <customControls:TurboButton x:Name="exampleControl" IntData="2" StringData="Test" />
    </StackLayout>
</ContentPage>

```

Now, you can use your properties in c#:

```
exampleControl.IntData
```

Note that you need to specify by yourself where your TurboButton class is placed in your project. I've done it in this line:

```
xmlns:customControls="clr-namespace:SomeApp.CustomControls;assembly=SomeApp"
```

You can freely change "customControls" to some other name. It's up to you how you will call it.

Chapter 24: Working with local databases

Section 24.1: Using SQLite.NET in a Shared Project

[SQLite.NET](#) is an open source library which makes it possible to add local-databases support using SQLite version 3 in a Xamarin.Forms project.

The steps below demonstrate how to include this component in a Xamarin.Forms Shared Project:

1. Download the latest version of the [SQLite.cs](#) class and add it to the Shared Project.
2. Every table that will be included in the database needs to be modeled as a class in the Shared Project. A table is defined by adding at least two attributes in the class: `Table` (for the class) and `PrimaryKey` (for a property).

For this example, a new class named `Song` is added to the Shared Project, defined as follows:

```
using System;
using SQLite;

namespace SongsApp
{
    [Table("Song")]
    public class Song
    {
        [PrimaryKey]
        public string ID { get; set; }
        public string SongName { get; set; }
        public string SingerName { get; set; }
    }
}
```

3. Next, add a new class called `Database`, which inherits from the `SQLiteConnection` class (included in `SQLite.cs`). In this new class, the code for database access, tables creation and CRUD operations for each table is defined. Sample code is shown below:

```
using System;
using System.Linq;
using System.Collections.Generic;
using SQLite;

namespace SongsApp
{
    public class BaseDatos : SQLiteConnection
    {
        public BaseDatos(string path) : base(path)
        {
            Initialize();
        }

        void Initialize()
        {
            CreateTable<Song>();
        }

        public List<Song> GetSongs()
        {
            return Table<Song>().ToList();
        }
    }
}
```

```

public Song GetSong(string id)
{
    return Table<Song>().Where(t => t.ID == id).First();
}

public bool AddSong(Song song)
{
    Insert(song);
}

public bool UpdateSong(Song song)
{
    Update(song);
}

public void DeleteSong(Song song)
{
    Delete(song);
}
}
}

```

4. As you could see in the previous step, the constructor of our Database class includes a path parameter, which represents the location of the file that stores the SQLite database file. A static Database object can be declared in App.cs. The path is platform-specific:

```

public class App : Application
{
    public static Database DB;

    public App ()
    {
        string dbFile = "SongsDB.db3";

#if __ANDROID__
        string docPath = Environment.GetFolderPath(Environment.SpecialFolder.Personal);
        var dbPath = System.IO.Path.Combine(docPath, dbFile);
#else
#if __IOS__
        string docPath = Environment.GetFolderPath(Environment.SpecialFolder.Personal);
        string libPath = System.IO.Path.Combine(docPath, "..", "Library");
        var dbPath = System.IO.Path.Combine(libPath, dbFile);
#else
        var dbPath = System.IO.Path.Combine(ApplicationData.Current.LocalFolder.Path, dbFile);
#endif
#endif

        DB = new Database(dbPath);

        // The root page of your application
        MainPage = new SongsPage();
    }
}

```

5. Now simply call the DB object through the App class anytime you need to perform a CRUD operation to the Songs table. For example, to insert a new Song after the user has clicked a button, you can use the following code:

```

void AddNewSongButton_Click(object sender, EventArgs a)
{
    Song s = new Song();
}

```

```

s.ID = Guid.NewGuid().ToString();
s.SongName = songNameEntry.Text;
s.SingerName = singerNameEntry.Text;

App.DB.AddSong(song);
}

```

Section 24.2: Working with local databases using xamarin.forms in visual studio 2015

SQLite example Step by step Explanation

1. The steps below demonstrate how to include this component in a Xamarin.Forms Shared Project: to add packages in (pcl,Android,Windows,Ios) Add References Click on **Manage Nuget packages** ->click on Browse to install **SQLite.Net.Core-PCL** , **SQLite Net Extensions** after installation is completed check it once in references then
2. To add Class **Employee.cs** below code

```

using SQLite.Net.Attributes;

namespace DatabaseEmployeeCreation.SQLite
{
    public class Employee
    {
        [PrimaryKey, AutoIncrement]
        public int Eid { get; set; }
        public string Ename { get; set; }
        public string Address { get; set; }
        public string phonenumber { get; set; }
        public string email { get; set; }
    }
}

```

3. To add one interface ISQLite

```

using SQLite.Net;
//using SQLite.Net;
namespace DatabaseEmployeeCreation.SQLite.ViewModel
{
    public interface ISQLite
    {
        SQLiteConnection GetConnection();
    }
}

```

4. Create a one class for database logics and methods below code is follow .

```

using SQLite.Net; using System.Collections.Generic; using System.Linq; using Xamarin.Forms; namespace DatabaseEmployeeCreation.SQLite.ViewModel { public class DatabaseLogic { static object locker = new object(); SQLiteConnection database;

```

```

public DatabaseLogic()
{
    database = DependencyService.Get<ISQLite>().GetConnection();
    // create the tables
    database.CreateTable<Employee>();
}

```



```

<Label Text="Address" />
<Editor x:Name="AddressEntry" Text="{Binding Address}"/>
<Label Text="phonenummer" />
<Entry x:Name="phonenummerEntry" Text="{Binding phonenummer}"/>
<Label Text="email" />
<Entry x:Name="emailEntry" Text="{Binding email}"/>

<Button Text="Add" Clicked="addClicked"/>

<!-- <Button Text="Delete" Clicked="deleteClicked"/>-->

<Button Text="Details" Clicked="DetailsClicked"/>

<!-- <Button Text="Edit" Clicked="speakClicked"/>-->

</StackLayout>
</ContentPage>

```

EmployeeRegistration.cs

```

using DatabaseEmployeeCreation.SQLite.ViewModel;
using DatabaseEmployeeCreation.SQLite.Views;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

using Xamarin.Forms;

namespace DatabaseEmployeeCreation.SQLite
{
    public partial class EmployeeRegistration : ContentPage
    {
        private int empid;
        private Employee obj;

        public EmployeeRegistration()
        {
            InitializeComponent();
        }

        public EmployeeRegistration(Employee obj)
        {
            this.obj = obj;
            var eid = obj.Eid;
            Navigation.PushModalAsync(new EmployeeRegistration());
            var Address = obj.Address;
            var email = obj.email;
            var Ename = obj.Ename;
            var phonenummer = obj.phonenummer;
            AddressEntry.Text = Address;
            emailEntry.Text = email;
            nameEntry.Text = Ename;

            //AddressEntry.Text = obj.Address;
            //emailEntry.Text = obj.email;
            //nameEntry.Text = obj.Ename;
            //phonenummerEntry.Text = obj.phonenummer;
        }
    }
}

```

```

        Employee empupdate = new Employee(); //updateing Values
        empupdate.Address = AddressEntry.Text;
        empupdate.Ename = nameEntry.Text;
        empupdate.email = emailEntry.Text;
        empupdate.Eid = obj.Eid;
        App.Database.SaveItem(empupdate);
        Navigation.PushModalAsync(new EmployeeRegistration());
    }

    public EmployeeRegistration(int empid)
    {
        this.empid = empid;
        Employee lst = App.Database.GetItem(empid);
        //var Address = lst.Address;
        //var email = lst.email;
        //var Ename = lst.Ename;
        //var phonenumber = lst.phonenumber;
        //AddressEntry.Text = Address;
        //emailEntry.Text = email;
        //nameEntry.Text = Ename;
        //phonenumberEntry.Text = phonenumber;

        // to retriva values based on id to
        AddressEntry.Text = lst.Address;
        emailEntry.Text = lst.email;
        nameEntry.Text = lst.Ename;
        phonenumberEntry.Text = lst.phonenumber;

        Employee empupdate = new Employee(); //updateing Values
        empupdate.Address = AddressEntry.Text;
        empupdate.email = emailEntry.Text;
        App.Database.SaveItem(empupdate);
        Navigation.PushModalAsync(new EmployeeRegistration());
    }

    void addClicked(object sender, EventArgs e)
    {
        //var createEmp = (Employee)BindingContext;
        Employee emp = new Employee();
        emp.Address = AddressEntry.Text;
        emp.email = emailEntry.Text;
        emp.Ename = nameEntry.Text;
        emp.phonenumber = phonenumberEntry.Text;
        App.Database.SaveItem(emp);
        this.Navigation.PushAsync(new EmployeeDetails());
    }

    //void deleteClicked(object sender, EventArgs e)
    //{
    //    var emp = (Employee)BindingContext;
    //    App.Database.DeleteItem(emp.Eid);
    //    this.Navigation.PopAsync();
    //}

    void DetailsClicked(object sender, EventArgs e)
    {
        var empcancel = (Employee)BindingContext;
        this.Navigation.PushAsync(new EmployeeDetails());
    }

    // void speakClicked(object sender, EventArgs e)
    // {
    //     var empspek = (Employee)BindingContext;

```

```

        // //DependencyService.Get<ITextSpeak>().Speak(empspek.Address + " " +
empspek.Ename);
        // }
    }
}

```

6. to display EmployeeDetails below code behind

```

using DatabaseEmployeeCreation;
using DatabaseEmployeeCreation.SQLite;
using System;
using System.Collections.Generic;
using System.Linq;
using System.Text;
using System.Threading.Tasks;

using Xamarin.Forms;

namespace DatabaseEmployeeCreation.SQLite.Views
{
    public partial class EmployeeDetails : ContentPage
    {
        ListView lv = new ListView();
        IEnumerable<Employee> lst;
        public EmployeeDetails()
        {
            InitializeComponent();
            displayemployee();
        }

        private void displayemployee()
        {
            Button btn = new Button()
            {
                Text = "Details",
                BackgroundColor = Color.Blue,
            };
            btn.Clicked += Btn_Clicked;
            //IEnumerable<Employee> lst = App.Database.GetItems();
            //IEnumerable<Employee> lst1 = App.Database.GetItemsNotDone();
            //IEnumerable<Employee> lst2 = App.Database.GetItemsNotDone();
            Content = new StackLayout()
            {
                Children = { btn },
            };
        }

        private void Btn_Clicked(object sender, EventArgs e)
        {
            lst = App.Database.GetItems();

            lv.ItemsSource = lst;
            lv.HasUnevenRows = true;
            lv.ItemTemplate = new DataTemplate(typeof(OptionsViewCell));

            Content = new StackLayout()
            {
                Children = { lv },
            };
        }
    }
}

```

```
}  
}
```

```
public class OptionsViewCell : ViewCell  
{  
  
    int empid;  
    Button btnEdit;  
    public OptionsViewCell()  
    {  
    }  
    protected override void OnBindingContextChanged()  
    {  
        base.OnBindingContextChanged();  
  
        if (this.BindingContext == null)  
            return;  
  
        dynamic obj = BindingContext;  
        empid = Convert.ToInt32(obj.Eid);  
        var lblname = new Label  
        {  
            BackgroundColor = Color.Lime,  
            Text = obj.Ename,  
        };  
  
        var lblAddress = new Label  
        {  
            BackgroundColor = Color.Yellow,  
            Text = obj.Address,  
        };  
  
        var lblphonenumber = new Label  
        {  
            BackgroundColor = Color.Pink,  
            Text = obj.phonenumber,  
        };  
  
        var lblemail = new Label  
        {  
            BackgroundColor = Color.Purple,  
            Text = obj.email,  
        };  
  
        var lblleid = new Label  
        {  
            BackgroundColor = Color.Silver,  
            Text = (empid).ToString(),  
        };  
  
        //var lblname = new Label  
        //{  
        //    BackgroundColor = Color.Lime,  
        //    // HorizontalOptions = LayoutOptions.Start  
        //};  
        //lblname.SetBinding(Label.TextProperty, "Ename");  
  
        //var lblAddress = new Label  
        //{  
        //    BackgroundColor = Color.Yellow,  
        //    //HorizontalOptions = LayoutOptions.Center,
```

```

});
//lblAddress.SetBinding(Label.TextProperty, "Address");

//var lblphonenumber = new Label
//{
//    BackgroundColor = Color.Pink,
//    //HorizontalOptions = LayoutOptions.CenterAndExpand,
//};
//lblphonenumber.SetBinding(Label.TextProperty, "phonenumber");

//var lblemail = new Label
//{
//    BackgroundColor = Color.Purple,
//    // HorizontalOptions = LayoutOptions.CenterAndExpand
//};
//lblemail.SetBinding(Label.TextProperty, "email");
//var lblleid = new Label
//{
//    BackgroundColor = Color.Silver,
//    // HorizontalOptions = LayoutOptions.CenterAndExpand
//};
//lblleid.SetBinding(Label.TextProperty, "Eid");
Button btnDelete = new Button
{
    BackgroundColor = Color.Gray,

    Text = "Delete",
    //WidthRequest = 15,
    //HeightRequest = 20,
    TextColor = Color.Red,
    HorizontalOptions = LayoutOptions.EndAndExpand,
};
btnDelete.Clicked += BtnDelete_Clicked;
//btnDelete.PropertyChanged += BtnDelete_PropertyChanged;

btnEdit = new Button
{
    BackgroundColor = Color.Gray,
    Text = "Edit",
    TextColor = Color.Green,
};
// lblleid.SetBinding(Label.TextProperty, "Eid");
btnEdit.Clicked += BtnEdit_Clicked1; ;
//btnEdit.Clicked += async (s, e) =>{
//    await App.Current.MainPage.Navigation.PushModalAsync(new
EmployeeRegistration());
//};

View = new StackLayout()
{
    Orientation = StackOrientation.Horizontal,
    BackgroundColor = Color.White,
    Children = { lblleid, lblname, lblAddress, lblemail, lblphonenumber, btnDelete,
btnEdit },
};

//View = new StackLayout()
//{ HorizontalOptions = LayoutOptions.Center, WidthRequest = 10, BackgroundColor =
Color.Yellow, Children = { lblAddress } };

//View = new StackLayout()
//{ HorizontalOptions = LayoutOptions.End, WidthRequest = 30, BackgroundColor =

```

```

Color.Yellow, Children = { lblemail } });

        //View = new StackLayout()
        //{ HorizontalOptions = LayoutOptions.End, BackgroundColor = Color.Green, Children =
        { lblphonenumber } });

        //string Empid =c.eid ;
    }

    private async void BtnEdit_Clicked1(object sender, EventArgs e)
    {
        Employee obj= App.Database.GetItem(empid);
        if (empid > 0)
        {
            await App.Current.MainPage.Navigation.PushModalAsync(new
EmployeeRegistration(obj));
        }
        else {
            await App.Current.MainPage.Navigation.PushModalAsync(new
EmployeeRegistration(empid));
        }
    }

    private void BtnDelete_Clicked(object sender, EventArgs e)
    {
        // var eid = Convert.ToInt32(empid);
        // var item = (Xamarin.Forms.Button)sender;
        int eid = empid;
        App.Database.DeleteItem(eid);
    }
    //private void BtnDelete_PropertyChanged(object sender,
System.ComponentModel.PropertyChangedEventArgs e)
    //{
    // var ename= e.PropertyName;
    //}
}

//private void BtnDelete_Clicked(object sender, EventArgs e)
//{
// var eid = 8;
// var item = (Xamarin.Forms.Button)sender;

// App.Database.DeleteItem(eid);
//}
}

```

7. To implement method in Android and ios GetConnection() method

```

using System;
using Xamarin.Forms;
using System.IO;
using DatabaseEmployeeCreation.Droid;
using DatabaseEmployeeCreation.SQLite.ViewModel;
using SQLite;
using SQLite.Net;

```

```

[assembly: Dependency(typeof(SQLiteEmployee_Andriod))]
namespace DatabaseEmployeeCreation.Droid
{
    public class SQLiteEmployee_Andriod : ISQLite
    {
        public SQLiteEmployee_Andriod()
        {
        }

        #region ISQLite implementation
        public SQLiteConnection GetConnection()
        {
            //var sqliteFilename = "EmployeeSQLite.db3";
            //string documentsPath =
System.Environment.GetFolderPath(System.Environment.SpecialFolder.Personal); // Documents folder
            //var path = Path.Combine(documentsPath, sqliteFilename);

            //// This is where we copy in the prepopulated database
            //Console.WriteLine(path);
            //if (!File.Exists(path))
            //{
            //    var s = Forms.Context.Resources.OpenRawResource(Resource.Raw.EmployeeSQLite);
// RESOURCE NAME ###

            //    // create a write stream
            //    FileStream writeStream = new FileStream(path, FileMode.OpenOrCreate,
FileAccess.Write);
            //    // write to the stream
            //    ReadWriteStream(s, writeStream);
            //}

            //var conn = new SQLiteConnection(path);

            //// Return the database connection
            //return conn;
            var filename = "DatabaseEmployeeCreationSQLite.db3";
            var documentspath = Environment.GetFolderPath(Environment.SpecialFolder.Personal);
            var path = Path.Combine(documentspath, filename);
            var platform = new SQLite.Net.Platform.XamarinAndroid.SQLitePlatformAndroid();
            var connection = new SQLite.Net.SQLiteConnection(platform, path);
            return connection;
        }

        //public SQLiteConnection GetConnection()
        //{
        //    var filename = "EmployeeSQLite.db3";
        //    var documentspath = Environment.GetFolderPath(Environment.SpecialFolder.Personal);
        //    var path = Path.Combine(documentspath, filename);

        //    var platform = new SQLite.Net.Platform.XamarinAndroid.SQLitePlatformAndroid();
        //    var connection = new SQLite.Net.SQLiteConnection(platform, path);
        //    return connection;
        //}
        #endregion

        /// <summary>
        /// helper method to get the database out of /raw/ and into the user filesystem
        /// </summary>
        void ReadWriteStream(Stream readStream, Stream writeStream)
        {
            int Length = 256;
            Byte[] buffer = new Byte[Length];

```



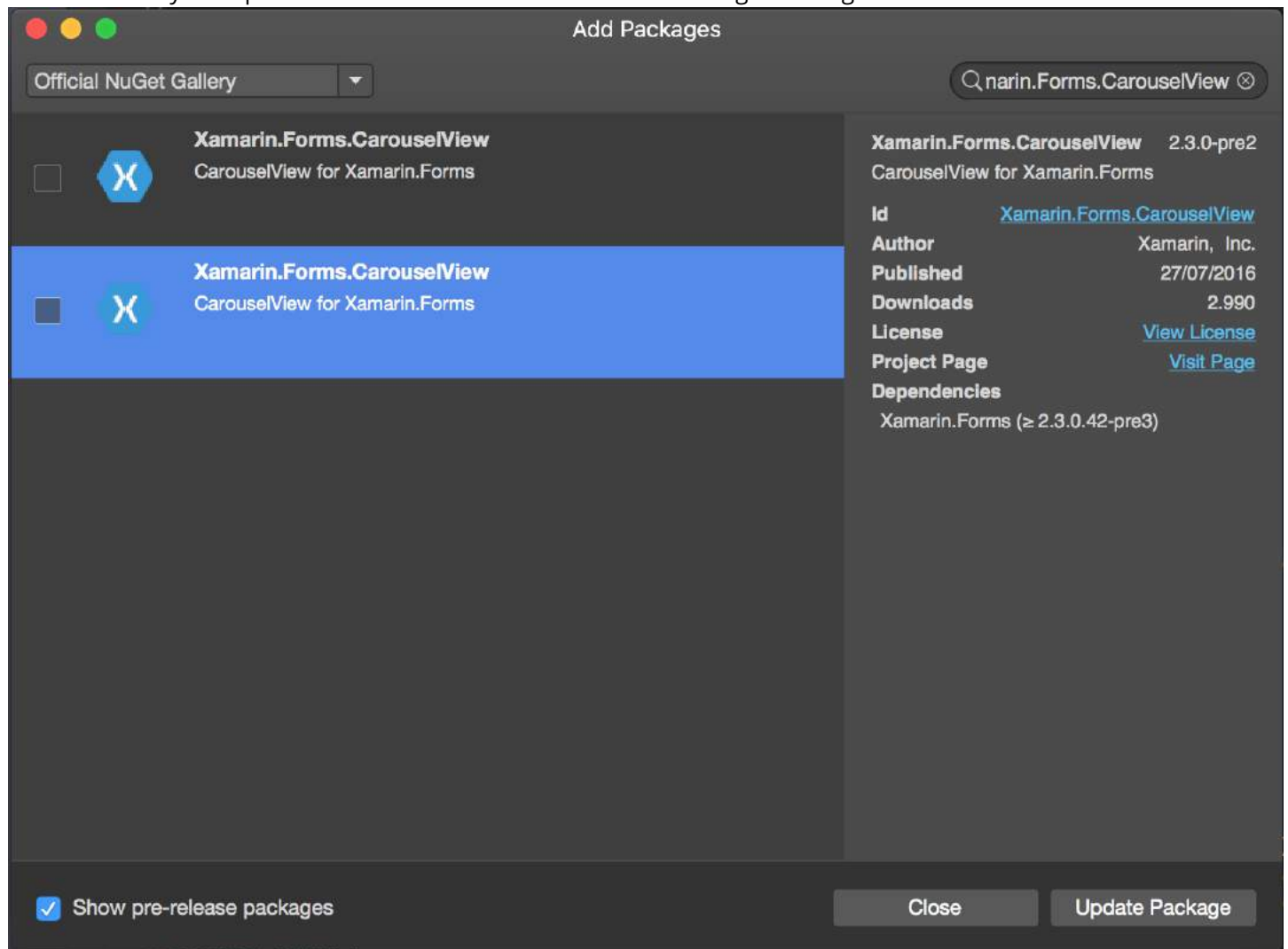
```
int bytesRead = readStream.Read(buffer, 0, Length);  
// write the required bytes  
while (bytesRead > 0)  
{  
    writeStream.Write(buffer, 0, bytesRead);  
    bytesRead = readStream.Read(buffer, 0, Length);  
}  
readStream.Close();  
writeStream.Close();  
}  
}  
}
```

I hope this above example is very easy way i explained

Chapter 25: CarouselView - Pre-release version

Section 25.1: Import CarouselView

The easiest way to import CarouselView is to use the NuGet-Packages Manager in Xamarin / Visual studio:



To use pre-release packages, make sure you enable the 'Show pre-release packages' checkbox at the left corner.

Each sub-project (.iOS/.droid/.WinPhone) must import this package.

Section 25.2: Import CarouselView into a XAML Page

The basics

In the heading of ContentPage, insert following line:

```
xmlns:cv="clr-namespace:Xamarin.Forms;assembly=Xamarin.Forms.CarouselView"
```

Between the <ContentPage.Content> tags place the CarouselView:

```
<cv:CarouselView x:Name="DemoCarouselView">  
</cv:CarouselView>
```

x:Name will give your CarouselView a name, which can be used in the C# code behind file. This is the basics you need to do for integrating CarouselView into a view. The given examples will not show you anything because the CarouselView is empty.

Creating bindable source

As example of an ItemSource, I will be using a ObservableCollection of strings.

```
public ObservableCollection<TechGiant> TechGiants { get; set; }
```

TechGiant is a class that will host names of Technology Giants

```
public class TechGiant
{
    public string Name { get; set; }

    public TechGiant(string Name)
    {
        this.Name = Name;
    }
}
```

After the InitializeComponent of your page, create and fill the ObservableCollection

```
TechGiants = new ObservableCollection<TechGiant>();
TechGiants.Add(new TechGiant("Xamarin"));
TechGiants.Add(new TechGiant("Microsoft"));
TechGiants.Add(new TechGiant("Apple"));
TechGiants.Add(new TechGiant("Google"));
```

At last, set TechGiants to be the ItemSource of the DemoCarouselView

```
DemoCarouselView.ItemsSource = TechGiants;
```

DataTemplates

In the XAML - file, give the CarouselView a DataTemplate:

```
<cv:CarouselView.ItemTemplate>
</cv:CarouselView.ItemTemplate>
```

Define a DataTemplate. In this case, this will be a Label with text bind to the itemsource and a green background:

```
<DataTemplate>
    <Label Text="{Binding Name}" BackgroundColor="Green" />
</DataTemplate>
```

That's it! Run the program and see the result!

Chapter 26: Exception handling

Section 26.1: One way to report about exceptions on iOS

Go to `Main.cs` file in **iOS project** and change existed code, like presented below:

```
static void Main(string[] args)
{
    try
    {
        UIApplication.Main(args, null, "AppDelegate");
    }
    catch (Exception ex)
    {
        Debug.WriteLine("iOS Main Exception: {0}", ex);

        var watson = new LittleWatson();
        watson.SaveReport(ex);
    }
}
```

`ILittleWatson` interface, used in portable code, could look like this:

```
public interface ILittleWatson
{
    Task<bool> SendReport();

    void SaveReport(Exception ex);
}
```

Implementation for **iOS project**:

```
[assembly: Xamarin.Forms.Dependency(typeof(LittleWatson))]
namespace SomeNamespace
{
    public class LittleWatson : ILittleWatson
    {
        private const string FileName = "Report.txt";

        private readonly static string DocumentsFolder;
        private readonly static string FilePath;

        private TaskCompletionSource<bool> _sendingTask;

        static LittleWatson()
        {
            DocumentsFolder = Environment.GetFolderPath(Environment.SpecialFolder.MyDocuments);
            FilePath = Path.Combine(DocumentsFolder, FileName);
        }

        public async Task<bool> SendReport()
        {
            _sendingTask = new TaskCompletionSource<bool>();

            try
            {
                var text = File.ReadAllText(FilePath);
                File.Delete(FilePath);
                if (MFMailComposeViewController.CanSendMail)
            }
        }
    }
}
```

```

    {
        var email = ""; // Put receiver email here.
        var mailController = new MFMailComposeViewController();
        mailController.SetToRecipients(new string[] { email });
        mailController.SetSubject("iPhone error");
        mailController.SetMessageBody(text, false);
        mailController.Finished += (object s, MFComposeResultEventArgs args) =>
        {
            args.Controller.DismissViewController(true, null);
            _sendingTask.TrySetResult(true);
        };

        ShowViewController(mailController);
    }
}
catch (FileNotFoundException)
{
    // No errors found.
    _sendingTask.TrySetResult(false);
}

return await _sendingTask.Task;
}

public void SaveReport(Exception ex)
{
    var exceptionInfo = $"{ex.Message} - {ex.StackTrace}";
    File.WriteAllText(FilePath, exceptionInfo);
}

private static void ShowViewController(UIViewController controller)
{
    var topController = UIApplication.SharedApplication.KeyWindow.RootViewController;
    while (topController.PresentedViewController != null)
    {
        topController = topController.PresentedViewController;
    }

    topController.PresentViewController(controller, true, null);
}
}
}

```

And then, somewhere, where app starts, put:

```

var watson = DependencyService.Get<ILittleWatson>();
if (watson != null)
{
    await watson.SendReport();
}

```

Chapter 27: SQL Database and API in Xamarin Forms.

Section 27.1: Create API using SQL database and implement in Xamarin forms,

[Source Code Blog](#)

Chapter 28: Contact Picker - Xamarin Forms (Android and iOS)

Section 28.1: contact_picker.cs

```
using System;

using Xamarin.Forms;

namespace contact_picker
{
    public class App : Application
    {
        public App ()
        {
            // The root page of your application
            MainPage = new MyPage();
        }

        protected override void OnStart ()
        {
            // Handle when your app starts
        }

        protected override void OnSleep ()
        {
            // Handle when your app sleeps
        }

        protected override void OnResume ()
        {
            // Handle when your app resumes
        }
    }
}
```

Section 28.2: MyPage.cs

```
using System;

using Xamarin.Forms;

namespace contact_picker
{
    public class MyPage : ContentPage
    {
        Button button;
        public MyPage ()
        {
            button = new Button {
                Text = "choose contact"
            };

            button.Clicked += async (object sender, EventArgs e) => {

                if (Device.OS == TargetPlatform.iOS) {
                    await Navigation.PushModalAsync (new ChooseContactPage ());
                }
            }
        }
    }
}
```

```

        else if (Device.OS == TargetPlatform.Android)
        {
            MessagingCenter.Send (this, "android_choose_contact", "number1");
        }

    };

    Content = new StackLayout {
        Children = {
            new Label { Text = "Hello ContentPage" },
            button
        }
    };
}

protected override void OnSizeAllocated (double width, double height)
{
    base.OnSizeAllocated (width, height);

    MessagingCenter.Subscribe<MyPage, string> (this, "num_select", (sender, arg) => {
        DisplayAlert ("contact", arg, "OK");
    });
}
}
}
}

```

Section 28.3: ChooseContactPicker.cs

```

using System;
using Xamarin.Forms;

namespace contact_picker
{
    public class ChooseContactPage : ContentPage
    {
        public ChooseContactPage ()
        {
        }
    }
}

```

Section 28.4: ChooseContactActivity.cs

```

using Android.App;
using Android.OS;
using Android.Content;
using Android.Database;
using Xamarin.Forms;

namespace contact_picker.Droid
{
    [Activity (Label = "ChooseContactActivity")]
    public class ChooseContactActivity : Activity
    {
        public string type_number = "";
    }
}

```



```

public class MainActivity : global::Xamarin.Forms.Platform.Android.FormsApplicationActivity
{
    protected override void OnCreate (Bundle bundle)
    {
        base.OnCreate (bundle);

        global::Xamarin.Forms.Forms.Init (this, bundle);

        LoadApplication (new App ());

        MessagingCenter.Subscribe<MyPage, string>(this, "android_choose_contact", (sender,
args) => {
            Intent i = new Intent (Android.App.Application.Context,
typeof(ChooseContactActivity));
            i.PutExtra ("number1", args);
            StartActivity (i);
        });
    }
}

```

Section 28.6: ChooseContactRenderer.cs

```

using UIKit;
using AddressBookUI;
using Xamarin.Forms;
using Xamarin.Forms.Platform.iOS;
using contact_picker;
using contact_picker.iOS;

[assembly: ExportRenderer (typeof(ChooseContactPage), typeof(ChooseContactRenderer))]

namespace contact_picker.iOS
{
    public partial class ChooseContactRenderer : PageRenderer
    {
        ABPeoplePickerNavigationController _contactController;

        public string type_number;

        protected override void OnElementChanged (VisualElementChangedEventArgs e)
        {
            base.OnElementChanged (e);

            var page = e.NewElement as ChooseContactPage;

            if (e.OldElement != null || Element == null) {
                return;
            }
        }

        public override void ViewDidLoad ()
        {
            base.ViewDidLoad ();

            _contactController = new ABPeoplePickerNavigationController ();
        }
    }
}

```

```

        this.PresentModalViewController (_contactController, true); //display contact chooser

        _contactController.Cancelled += delegate {
            Xamarin.Forms.Application.Current.MainPage.Navigation.PopModalAsync ();

            this.DismissModalViewController (true); };

        _contactController.SelectPerson2 += delegate(object sender,
ABPeoplePickerSelectPerson2EventArgs e) {

            var getphones = e.Person.GetPhones();
            string number = "";

            if (getphones == null)
            {
                number = "Nothing";
            }
            else if (getphones.Count > 1)
            {
                //il ya plus de 2 num de telephone
                foreach(var t in getphones)
                {
                    number = t.Value + "/" + number;
                }
            }
            else if (getphones.Count == 1)
            {
                //il ya 1 num de telephone
                foreach(var t in getphones)
                {
                    number = t.Value;
                }
            }

            Xamarin.Forms.Application.Current.MainPage.Navigation.PopModalAsync ();

            var twopage_renderer = new MyPage();
            MessagingCenter.Send<MyPage, string> (twopage_renderer, "num_select", number);
            this.DismissModalViewController (true);

        };
    }

    public override void ViewDidUnload ()
    {
        base.ViewDidUnload ();

        // Clear any references to subviews of the main view in order to
        // allow the Garbage Collector to collect them sooner.
        //
        // e.g. myOutlet.Dispose (); myOutlet = null;

        this.DismissModalViewController (true);
    }

    public override bool ShouldAutorotateToInterfaceOrientation (UIInterfaceOrientation
toInterfaceOrientation)

```

```
{  
    // Return true for supported orientations  
    return (toInterfaceOrientation != UIInterfaceOrientation.PortraitUpsideDown);  
}  
}
```

Chapter 29: Xamarin Plugin

Section 29.1: Media Plugin

Take or pick photos and videos from a cross platform API.

Available Nuget : [<https://www.nuget.org/packages/Xam.Plugin.Media/>][1]

XAML

```
<StackLayout Spacing="10" Padding="10">
  <Button x:Name="takePhoto" Text="Take Photo" />
  <Button x:Name="pickPhoto" Text="Pick Photo" />
  <Button x:Name="takeVideo" Text="Take Video" />
  <Button x:Name="pickVideo" Text="Pick Video" />
  <Label Text="Save to Gallery" />
  <Switch x:Name="saveToGallery" IsToggled="false" HorizontalOptions="Center" />
  <Label Text="Image will show here" />
  <Image x:Name="image" />
  <Label Text="" />

</StackLayout>
```

Code

```
namespace PluginDemo
{
    public partial class MediaPage : ContentPage
    {
        public MediaPage()
        {
            InitializeComponent();
            takePhoto.Clicked += async (sender, args) =>
            {
                if (!CrossMedia.Current.IsCameraAvailable ||
                !CrossMedia.Current.IsTakePhotoSupported)
                {
                    await DisplayAlert("No Camera", ":( No camera available.", "OK");
                    return;
                }
                try
                {
                    var file = await CrossMedia.Current.TakePhotoAsync(new
Plugin.Media.Abstractions.StoreCameraMediaOptions
                    {
                        Directory = "Sample",
                        Name = "test.jpg",
                        SaveToAlbum = saveToGallery.IsToggled
                    });

                    if (file == null)
                        return;

                    await DisplayAlert("File Location", (saveToGallery.IsToggled ? file.AlbumPath :
file.Path), "OK");

                    image.Source = ImageSource.FromStream(() =>
                    {
```

```

        var stream = file.GetStream();
        file.Dispose();
        return stream;
    });
}
catch //(Exception ex)
{
    // Xamarin.Insights.Report(ex);
    // await DisplayAlert("Uh oh", "Something went wrong, but don't worry we captured
it in Xamarin Insights! Thanks.", "OK");
}
};

pickPhoto.Clicked += async (sender, args) =>
{
    if (!CrossMedia.Current.IsPickPhotoSupported)
    {
        await DisplayAlert("Photos Not Supported", ":( Permission not granted to
photos.", "OK");
        return;
    }
    try
    {
        Stream stream = null;
        var file = await CrossMedia.Current.PickPhotoAsync().ConfigureAwait(true);

        if (file == null)
            return;

        stream = file.GetStream();
        file.Dispose();

        image.Source = ImageSource.FromStream(() => stream);
    }
    catch //(Exception ex)
    {
        // Xamarin.Insights.Report(ex);
        // await DisplayAlert("Uh oh", "Something went wrong, but don't worry we captured
it in Xamarin Insights! Thanks.", "OK");
    }
};

takeVideo.Clicked += async (sender, args) =>
{
    if (!CrossMedia.Current.IsCameraAvailable ||
!CrossMedia.Current.IsTakeVideoSupported)
    {
        await DisplayAlert("No Camera", ":( No camera available.", "OK");
        return;
    }

    try
    {
        var file = await CrossMedia.Current.TakeVideoAsync(new
Plugin.Media.Abstractions.StoreVideoOptions
        {
            Name = "video.mp4",
            Directory = "DefaultVideos",
            SaveToAlbum = saveToGallery.IsToggled
        });
    }
};

```



```
</StackLayout>
```

C#

```
async void Button_OnClicked(object sender, EventArgs e)
{
    switch (((Button)sender).StyleId)
    {
        case "Text":
            await CrossShare.Current.Share("Follow @JamesMontemagno on Twitter", "Share");
            break;
        case "Link":
            await CrossShare.Current.ShareLink("http://motzcod.es", "Checkout my blog",
"MotzCod.es");
            break;
        case "Browser":
            await CrossShare.Current.OpenBrowser("http://motzcod.es");
            break;
    }
}
```

Section 29.3: ExternalMaps

External Maps Plugin Open external maps to navigate to a specific geolocation or address. Option to launch with navigation option on iOS as well.

Available on NuGet : [\[https://www.nuget.org/packages/Xam.Plugin.ExternalMaps/\]\[1\]](https://www.nuget.org/packages/Xam.Plugin.ExternalMaps/)

XAML

```
<StackLayout Spacing="10" Padding="10">
    <Button x:Name="navigateAddress" Text="Navigate to Address" />
    <Button x:Name="navigateLatLong" Text="Navigate to Lat|Long" />
    <Label Text="" />
</StackLayout>
```

Code

```
namespace PluginDemo
{
    public partial class ExternalMaps : ContentPage
    {
        public ExternalMaps()
        {
            InitializeComponent();
            navigateLatLong.Clicked += (sender, args) =>
            {
                CrossExternalMaps.Current.NavigateTo("Space Needle", 47.6204, -122.3491);
            };

            navigateAddress.Clicked += (sender, args) =>
            {
                CrossExternalMaps.Current.NavigateTo("Xamarin", "394 pacific ave.", "San
Francisco", "CA", "94111", "USA", "USA");
            };
        }
    }
}
```



```
}
```

Section 29.4: Geolocator Plugin

Easily access geolocation across Xamarin.iOS, Xamarin.Android and Windows.

Available Nuget: [<https://www.nuget.org/packages/Xam.Plugin.Geolocator/>][1]

XAML

```
<StackLayout Spacing="10" Padding="10">
  <Button x:Name="buttonGetGPS" Text="Get GPS"/>
  <Label x:Name="labelGPS"/>
  <Button x:Name="buttonTrack" Text="Track Movements"/>
  <Label x:Name="labelGPSTrack"/>
  <Label Text="" />
</StackLayout>
```

Code

```
namespace PluginDemo
{
    public partial class GeolocatorPage : ContentPage
    {
        public GeolocatorPage()
        {
            InitializeComponent();
            buttonGetGPS.Clicked += async (sender, args) =>
            {
                try
                {
                    var locator = CrossGeolocator.Current;
                    locator.DesiredAccuracy = 1000;
                    labelGPS.Text = "Getting gps";

                    var position = await locator.GetPositionAsync(timeoutMilliseconds: 10000);

                    if (position == null)
                    {
                        labelGPS.Text = "null gps :(";
                        return;
                    }
                    labelGPS.Text = string.Format("Time: {0} \nLat: {1} \nLong: {2} \nAltitude: {3} \nAltitude Accuracy: {4} \nAccuracy: {5} \nHeading: {6} \nSpeed: {7}",
                        position.Timestamp, position.Latitude, position.Longitude,
                        position.Altitude, position.AltitudeAccuracy, position.Accuracy,
                        position.Heading, position.Speed);
                }
                catch //(Exception ex)
                {
                    // Xamarin.Insights.Report(ex);
                    // await DisplayAlert("Uh oh", "Something went wrong, but don't worry we captured it in Xamarin Insights! Thanks.", "OK");
                }
            };

            buttonTrack.Clicked += async (object sender, EventArgs e) =>
            {
```

```

        try
        {
            if (CrossGeolocator.Current.IsListening)
            {
                await CrossGeolocator.Current.StopListeningAsync();
                labelGPSTrack.Text = "Stopped tracking";
                buttonTrack.Text = "Stop Tracking";
            }
            else
            {
                if (await CrossGeolocator.Current.StartListeningAsync(30000, 0))
                {
                    labelGPSTrack.Text = "Started tracking";
                    buttonTrack.Text = "Track Movements";
                }
            }
        }
        catch //(Exception ex)
        {
            //Xamarin.Insights.Report(ex);
            // await DisplayAlert("Uh oh", "Something went wrong, but don't worry we captured
it in Xamarin Insights! Thanks.", "OK");
        }
    };
}

protected override void OnAppearing()
{
    base.OnAppearing();
    try
    {
        CrossGeolocator.Current.PositionChanged += CrossGeolocator_Current_PositionChanged;
        CrossGeolocator.Current.PositionError += CrossGeolocator_Current_PositionError;
    }
    catch
    {
    }
}

void CrossGeolocator_Current_PositionError(object sender,
Plugin.Geolocator.Abstractions.PositionErrorEventArgs e)
{
    labelGPSTrack.Text = "Location error: " + e.Error.ToString();
}

void CrossGeolocator_Current_PositionChanged(object sender,
Plugin.Geolocator.Abstractions.PositionEventArgs e)
{
    var position = e.Position;
    labelGPSTrack.Text = string.Format("Time: {0} \nLat: {1} \nLong: {2} \nAltitude: {3}
\nAltitude Accuracy: {4} \nAccuracy: {5} \nHeading: {6} \nSpeed: {7}",
        position.Timestamp, position.Latitude, position.Longitude,
        position.Altitude, position.AltitudeAccuracy, position.Accuracy, position.Heading,
position.Speed);
}

protected override void OnDisappearing()
{
    base.OnDisappearing();
}

```

```

        try
        {
            CrossGeolocator.Current.PositionChanged -= CrossGeolocator_Current_PositionChanged;
            CrossGeolocator.Current.PositionError -= CrossGeolocator_Current_PositionError;
        }
        catch
        {
        }
    }
}
}

```

Section 29.5: Messaging Plugin

Messaging plugin for Xamarin and Windows to make a phone call, send a sms or send an e-mail using the default messaging applications on the different mobile platforms.

Available Nuget : [<https://www.nuget.org/packages/Xam.Plugins.Messaging/>][1]

XAML

```

<StackLayout Spacing="10" Padding="10">
    <Entry Placeholder="Phone Number" x:Name="phone" />
    <Button x:Name="buttonSms" Text="Send SMS" />
    <Button x:Name="buttonCall" Text="Call Phone Number" />
    <Entry Placeholder="E-mail Address" x:Name="email" />
    <Button x:Name="buttonEmail" Text="Send E-mail" />
    <Label Text="" />
</StackLayout>

```

Code

```

namespace PluginDemo
{
    public partial class MessagingPage : ContentPage
    {
        public MessagingPage()
        {
            InitializeComponent();
            buttonCall.Clicked += async (sender, e) =>
            {
                try
                {
                    // Make Phone Call
                    var phoneCallTask = MessagingPlugin.PhoneDialer;
                    if (phoneCallTask.CanMakePhoneCall)
                        phoneCallTask.MakePhoneCall(phone.Text);
                    else
                        await DisplayAlert("Error", "This device can't place calls", "OK");
                }
                catch
                {
                    // await DisplayAlert("Error", "Unable to perform action", "OK");
                }
            };

            buttonSms.Clicked += async (sender, e) =>
            {
                try

```


Code

```
bool busy;
async void ButtonPermission_OnClicked(object sender, EventArgs e)
{
    if (busy)
        return;

    busy = true;
    ((Button)sender).IsEnabled = false;

    var status = PermissionStatus.Unknown;
    switch (((Button)sender).StyleId)
    {
        case "Calendar":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Calendar);
            break;
        case "Camera":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Camera);
            break;
        case "Contacts":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Contacts);
            break;
        case "Microphone":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Microphone);
            break;
        case "Phone":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Phone);
            break;
        case "Photos":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Photos);
            break;
        case "Reminders":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Reminders);
            break;
        case "Sensors":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Sensors);
            break;
        case "Sms":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Sms);
            break;
        case "Storage":
            status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Storage);
            break;
    }

    await DisplayAlert("Results", status.ToString(), "OK");

    if (status != PermissionStatus.Granted)
    {
        switch (((Button)sender).StyleId)
        {
```

```

        case "Calendar":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Calendar))[Permission.Calendar];
            break;
        case "Camera":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Camera))[Permission.Camera];
            break;
        case "Contacts":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Contacts))[Permission.Contacts];
            break;
        case "Microphone":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Microphone))[Permission.Microphone];
            break;
        case "Phone":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Phone))[Permission.Phone];
            break;
        case "Photos":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Photos))[Permission.Photos];
            break;
        case "Reminders":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Reminders))[Permission.Reminders];
            break;
        case "Sensors":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Sensors))[Permission.Sensors];
            break;
        case "Sms":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Sms))[Permission.Sms];
            break;
        case "Storage":
            status = (await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Storage))[Permission.Storage];
            break;
    }

    await DisplayAlert("Results", status.ToString(), "OK");

}

busy = false;
((Button)sender).IsEnabled = true;
}

async void Button_OnClicked(object sender, EventArgs e)
{
    if (busy)
        return;

    busy = true;
    ((Button)sender).IsEnabled = false;

    try
    {
        var status = await
CrossPermissions.Current.CheckPermissionStatusAsync(Permission.Location);

```

```

        if (status != PermissionStatus.Granted)
        {
            if (await
CrossPermissions.Current.ShouldShowRequestPermissionRationaleAsync(Permission.Location))
            {
                await DisplayAlert("Need location", "Gunna need that location", "OK");
            }

            var results = await
CrossPermissions.Current.RequestPermissionsAsync(Permission.Location);
            status = results[Permission.Location];
        }

        if (status == PermissionStatus.Granted)
        {
            var results = await CrossGeocator.Current.GetPositionAsync(10000);
            LabelGeolocation.Text = "Lat: " + results.Latitude + " Long: " +
results.Longitude;
        }
        else if (status != PermissionStatus.Unknown)
        {
            await DisplayAlert("Location Denied", "Can not continue, try again.", "OK");
        }
    }
    catch (Exception ex)
    {
        LabelGeolocation.Text = "Error: " + ex;
    }

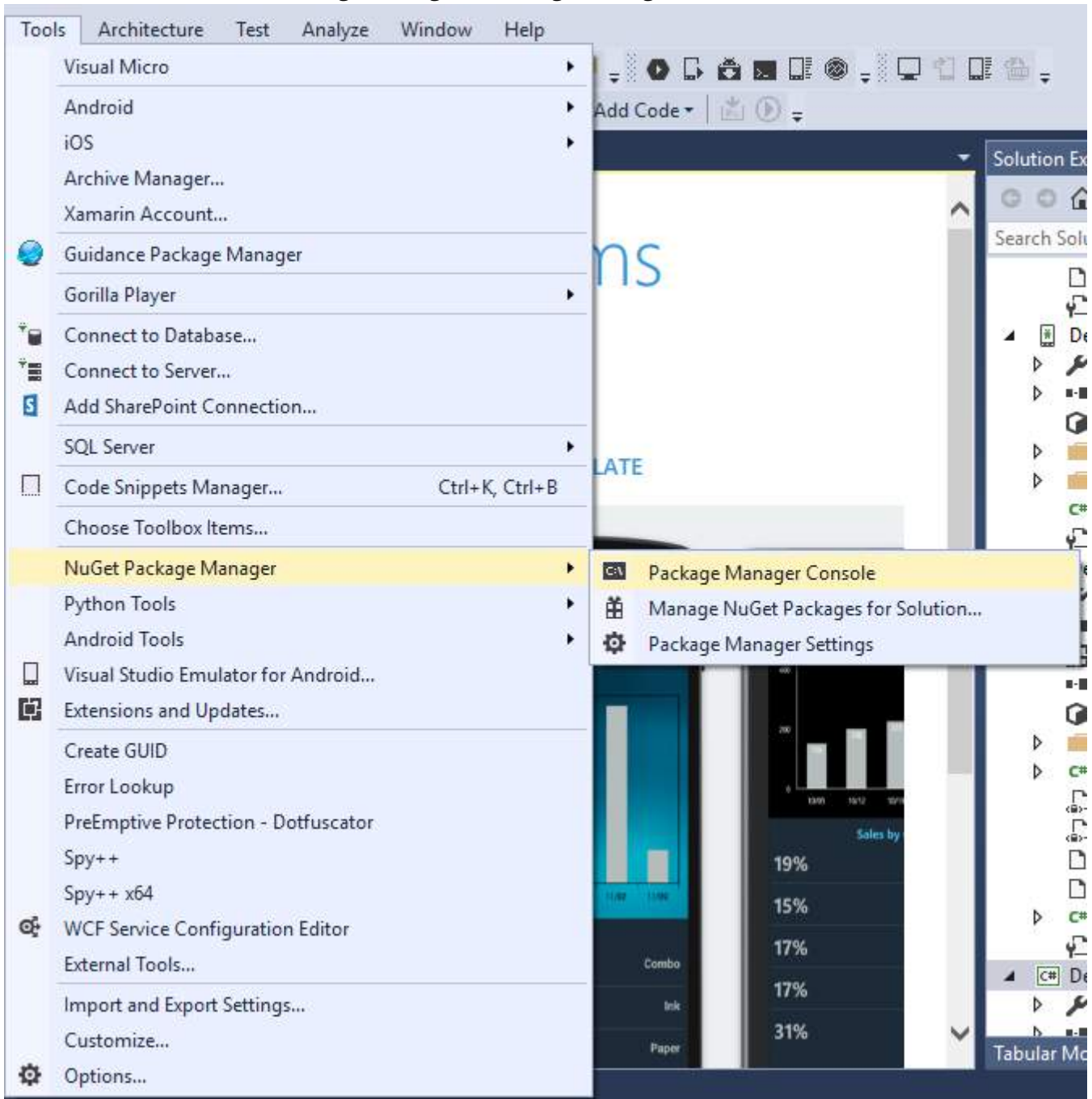
    ((Button)sender).IsEnabled = true;
    busy = false;
}

```

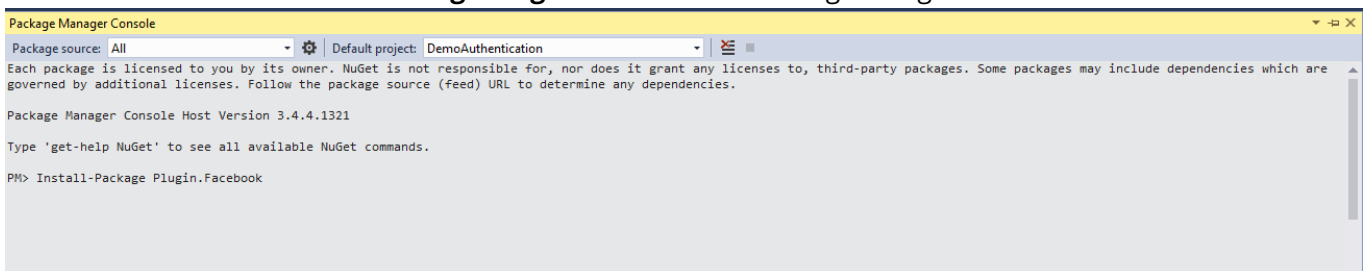
Chapter 30: OAuth2

Section 30.1: Authentication by using Plugin

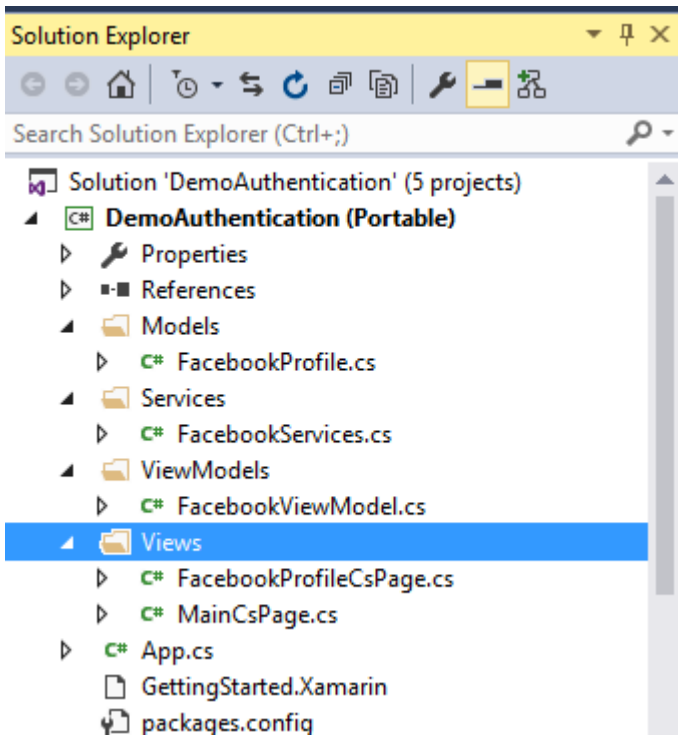
1. First, Go to **Tools > NuGet Package Manager > Package Manager Console**.



2. Enter this Command "**Install-Package Plugin.Facebook**" in Package Manger Console.



3. Now all the file is automatically created.



Video : [Login with Facebook in Xamarin Forms](#)

Other Authentication by using Plugin. Please place the command in Package Manager Console as shown in Step 2.

1. **Youtube** : Install-Package Plugin.Youtube
2. **Twitter** : Install-Package Plugin.Twitter
3. **Foursquare** : Install-Package Plugin.Foursquare
4. **Google** : Install-Package Plugin.Google
5. **Instagram** : Install-Package Plugin.Instagram
6. **Eventbrite** : Install-Package Plugin.Eventbrite

Chapter 31: MessagingCenter

Xamarin.Forms has a built-in messaging mechanism to promote decoupled code. This way, view models and other components do not need to know each other. They can communicate by a simple messaging contract.

There are basically two main ingredients for using the MessagingCenter.

Subscribe; listen for messages with a certain signature (the contract) and execute code when a message is received. A message can have multiple subscribers.

Send; sending a message for subscribers to act upon.

Section 31.1: Simple example

Here we will see a simple example of using the MessagingCenter in Xamarin.Forms.

First, let's have a look at subscribing to a message. In the FooMessaging model we subscribe to a message coming from the MainPage. The message should be "Hi" and when we receive it, we register a handler which sets the property Greeting. Lastly `this` means the current FooMessaging instance is registering for this message.

```
public class FooMessaging
{
    public string Greeting { get; set; }

    public FooMessaging()
    {
        MessagingCenter.Subscribe<MainPage> (this, "Hi", (sender) => {
            this.Greeting = "Hi there!";
        });
    }
}
```

To send a message triggering this functionality, we need to have a page called MainPage, and implement code like underneath.

```
public class MainPage : Page
{
    private void OnButtonClick(object sender, EventArgs args)
    {
        MessagingCenter.Send<MainPage> (this, "Hi");
    }
}
```

In our MainPage we have a button with a handler that sends a message. `this` should be an instance of MainPage.

Section 31.2: Passing arguments

You can also pass arguments with a message to work with.

We will use the classed from our previous example and extend them. In the receiving part, right behind the Subscribe method call add the type of the argument you are expecting. Also make sure you also declare the arguments in the handler signature.

```
public class FooMessaging
{
```

```

public string Greeting { get; set; }

public FooMessaging()
{
    MessagingCenter.Subscribe<MainPage, string> (this, "Hi", (sender, arg) => {
        this.Greeting = arg;
    });
}
}

```

When sending a message, make sure to include the argument value. Also, here you add the type right behind the Send method and add the argument value.

```

public class MainPage : Page
{
    private void OnButtonClick(object sender, EventArgs args)
    {
        MessagingCenter.Send<MainPage, string> (this, "Hi", "Hi there!");
    }
}

```

In this example a simple string is used, but you can also use any other type of (complex) objects.

Section 31.3: Unsubscribing

When you no longer need to receive messages, you can simply unsubscribe. You can do it like this:

```
MessagingCenter.Unsubscribe<MainPage> (this, "Hi");
```

When you are supplying arguments, you have to unsubscribe from the complete signature, like this:

```
MessagingCenter.Unsubscribe<MainPage, string> (this, "Hi");
```

Chapter 32: Generic Xamarin.Forms app lifecycle? Platform-dependant!

Section 32.1: Xamarin.Forms lifecycle is not the actual app lifecycle but a cross-platform representation of it

Lets have a look at the native app lifecycle methods for different platforms.

Android.

```
//Xamarin.Forms.Platform.Android.FormsApplicationActivity lifecycle methods:
protected override void OnCreate(Bundle savedInstanceState);
protected override void OnDestroy();
protected override void OnPause();
protected override void OnRestart();
protected override void OnResume();
protected override void OnStart();
protected override void OnStop();
```

iOS.

```
//Xamarin.Forms.Platform.iOS.FormsApplicationDelegate lifecycle methods:
public override void DidEnterBackground(UIApplication uiApplication);
public override bool FinishedLaunching(UIApplication uiApplication, NSDictionary launchOptions);
public override void OnActivated(UIApplication uiApplication);
public override void OnResignActivation(UIApplication uiApplication);
public override void WillEnterForeground(UIApplication uiApplication);
public override bool WillFinishLaunching(UIApplication uiApplication, NSDictionary launchOptions);
public override void WillTerminate(UIApplication uiApplication);
```

Windows.

```
//Windows.UI.Xaml.Application lifecycle methods:
public event EventHandler<System.Object> Resuming;
public event SuspendingEventHandler Suspending;
protected virtual void OnActivated(IActivatedEventArgs args);
protected virtual void OnFileActivated(FileActivatedEventArgs args);
protected virtual void OnFileOpenPickerActivated(FileOpenPickerActivatedEventArgs args);
protected virtual void OnFileSavePickerActivated(FileSavePickerActivatedEventArgs args);
protected virtual void OnLaunched(LaunchActivatedEventArgs args);
protected virtual void OnSearchActivated(SearchActivatedEventArgs args);
protected virtual void OnShareTargetActivated(ShareTargetActivatedEventArgs args);
protected virtual void OnWindowCreated(WindowCreatedEventArgs args);

//Windows.UI.Xaml.Window lifecycle methods:
public event WindowActivatedEventHandler Activated;
public event WindowClosedEventHandler Closed;
public event WindowVisibilityChangedEventHandler VisibilityChanged;
```

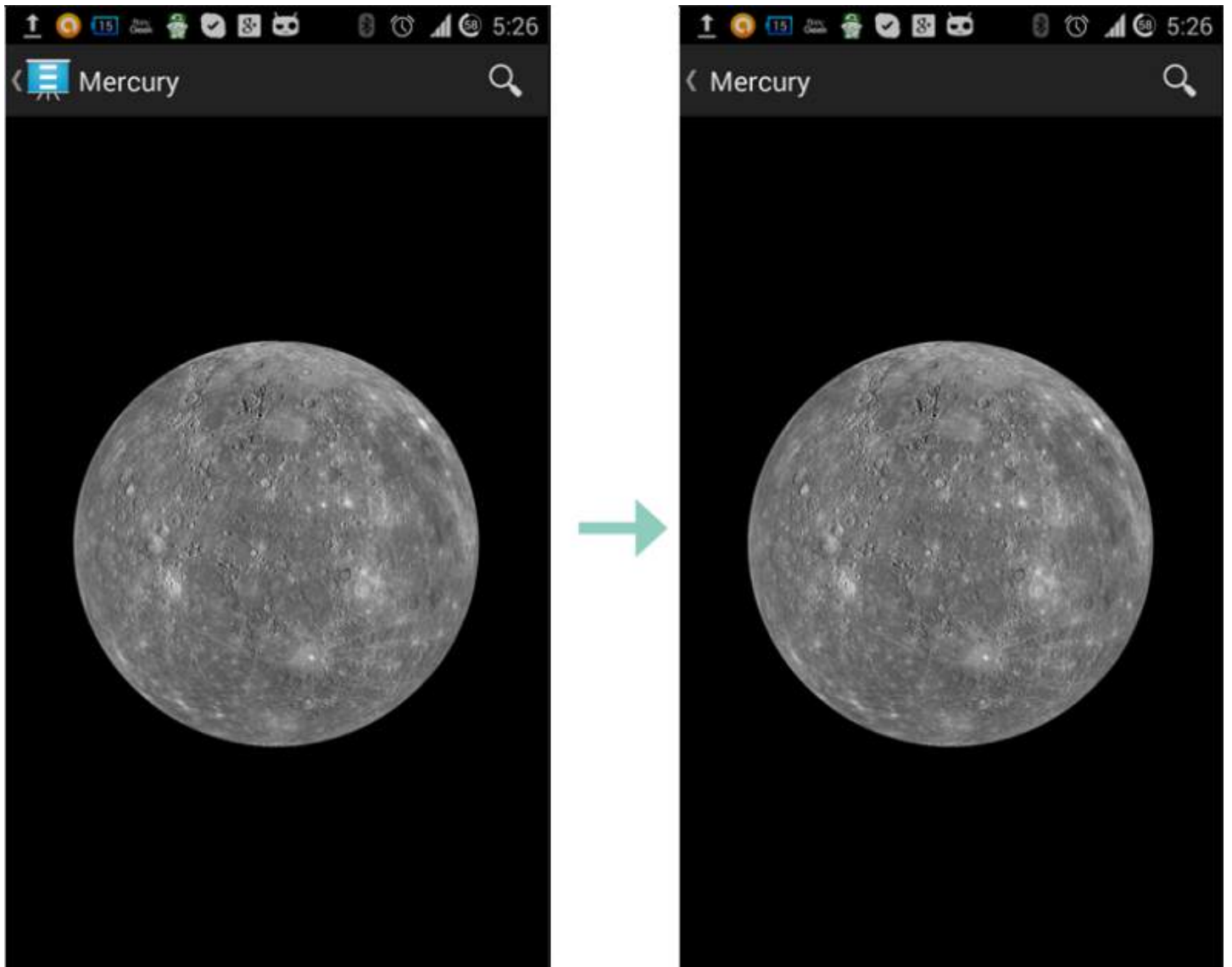
And now **Xamarin.Forms** app lifecycle methods:

```
//Xamarin.Forms.Application lifecycle methods:
protected virtual void OnResume();
protected virtual void OnSleep();
protected virtual void OnStart();
```

What you can easily tell from merely observing the lists, the Xamarin.Forms cross-platform app lifecycle perspective is greatly simplified. It gives you the generic clue about what state your app is in but in most production cases you will have to build some platform-dependant logic.

Chapter 33: Platform-specific behaviour

Section 33.1: Removing icon in navigation header in Anroid



Using a small transparent image called `empty.png`

```
public class MyPage : ContentPage
{
    public Page()
    {
        if (Device.OS == TargetPlatform.Android)
            NavigationPage.SetTitleIcon(this, "empty.png");
    }
}
```

Section 33.2: Make label's font size smaller in iOS

```
Label label = new Label
{
    Text = "text"
};
if(Device.OS == TargetPlatform.iOS)
{
    label.FontSize = label.FontSize - 2;
}
```

```
}
```

Chapter 34: Platform specific visual adjustments

Section 34.1: Idiom adjustments

Idiom specific adjustments can be done from C# code, for example for changing the layout orientation whether the view is shown on a phone or a tablet.

```
if (Device.Idiom == TargetIdiom.Phone)
{
    this.panel.Orientation = StackOrientation.Vertical;
}
else
{
    this.panel.Orientation = StackOrientation.Horizontal;
}
```

Those functionalities are also available directly from XAML code :

```
<StackLayout x:Name="panel">
  <StackLayout.Orientation>
    <OnIdiom x:TypeArguments="StackOrientation">
      <OnIdiom.Phone>Vertical</OnIdiom.Phone>
      <OnIdiom.Tablet>Horizontal</OnIdiom.Tablet>
    </OnIdiom>
  </StackLayout.Orientation>
</StackLayout>
```

Section 34.2: Platform adjustments

Adjustments can be done for specific platforms from C# code, for example for changing padding for all the targeted platforms.

```
if (Device.OS == TargetPlatform.iOS)
{
    panel.Padding = new Thickness (10);
}
else
{
    panel.Padding = new Thickness (20);
}
```

An helper method is also available for shortened C# declarations :

```
panel.Padding = new Thickness (Device.OnPlatform(10,20,0));
```

Those functionalities are also available directly from XAML code :

```
<StackLayout x:Name="panel">
  <StackLayout.Padding>
    <OnPlatform x:TypeArguments="Thickness"
      iOS="10"
      Android="20" />
  </StackLayout.Padding>
</StackLayout>
```


Section 34.3: Using styles

When working with XAML, using a centralized `Style` allows you to update a set of styled views from one place. All the idiom and platform adjustments can also be integrated to your styles.

```
<Style TargetType="StackLayout">
  <Setter Property="Padding">
    <Setter.Value>
      <OnPlatform x:TypeArguments="Thickness"
        iOS="10"
        Android="20" />
    </Setter.Value>
  </Setter>
</Style>
```

Section 34.4: Using custom views

You can create custom views that can be integrated to your page thanks to those adjustment tools.

Select `File > New > File... > Forms > Forms ContentView (Xaml)` and create a view for each specific layout: `TabletHome.xaml` and `PhoneHome.xaml`.

Then select `File > New > File... > Forms > Forms ContentPage` and create a `HomePage.cs` that contains:

```
using Xamarin.Forms;

public class HomePage : ContentPage
{
    public HomePage()
    {
        if (Device.Idiom == TargetIdiom.Phone)
        {
            Content = new PhoneHome();
        }
        else
        {
            Content = new TabletHome();
        }
    }
}
```

You now have a `HomePage` that creates a different view hierarchy for `Phone` and `Tablet` idioms.

Chapter 35: Dependency Services

Section 35.1: Access Camera and Gallery

<https://github.com/vDoers/vDoersCameraAccess>

Chapter 36: Unit Testing

Section 36.1: Testing the view models

Before we start...

In terms of application layers your ViewModel is a class containing all the business logic and rules making the app do what it should according to the requirements. It's also important to make it as much independent as possible reducing references to UI, data layer, native features and API calls etc. All of these makes your VM be testable. In short, your ViewModel:

- Should not depend on UI classes (views, pages, styles, events);
- Should not use static data of another classes (as much as you can);
- Should implement the business logic and prepare data to be should on UI;
- Should use other components (database, HTTP, UI-specific) via interfaces being resolved using Dependency Injection.

Your ViewModel may have properties of another VMs types as well. For example `ContactsPageViewModel` will have property of collection type like `ObservableCollection<ContactListItemViewModel>`

Business requirements

Let's say we have the following functionality to implement:

```
As an unauthorized user
I want to log into the app
So that I will access the authorized features
```

After clarifying the user story we defined the following scenarios:

```
Scenario: trying to log in with valid non-empty creds
Given the user is on Login screen
When the user enters 'user' as username
And the user enters 'pass' as password
And the user taps the Login button
Then the app shows the loading indicator
And the app makes an API call for authentication
```

```
Scenario: trying to log in empty username
Given the user is on Login screen
When the user enters ' ' as username
And the user enters 'pass' as password
And the user taps the Login button
Then the app shows an error message saying 'Please, enter correct username and password'
And the app doesn't make an API call for authentication
```

We will stay with only these two scenarios. Of course, there should be much more cases and you should define all of them before actual coding, but it's pretty enough for us now to get familiar with unit testing of view models.

Let's follow the classical TDD approach and start with writing an empty class being tested. Then we will write tests and will make them green by implementing the business functionality.

Common classes

```
public abstract class BaseViewModel : INotifyPropertyChanged
{
    public event PropertyChangedEventHandler PropertyChanged;

    protected virtual void OnPropertyChanged([CallerMemberName] string propertyName = null)
    {
        PropertyChanged?.Invoke(this, new PropertyChangedEventArgs(propertyName));
    }
}
```

Services

Do you remember our view model must not utilize UI and HTTP classes directly? You should define them as abstractions instead and [not to depend on implementation details](#).

```
/// <summary>
/// Provides authentication functionality.
/// </summary>
public interface IAuthenticationService
{
    /// <summary>
    /// Tries to authenticate the user with the given credentials.
    /// </summary>
    /// <param name="userName">UserName</param>
    /// <param name="password">User's password</param>
    /// <returns>true if the user has been successfully authenticated</returns>
    Task<bool> Login(string userName, string password);
}

/// <summary>
/// UI-specific service providing abilities to show alert messages.
/// </summary>
public interface IAlertService
{
    /// <summary>
    /// Show an alert message to the user.
    /// </summary>
    /// <param name="title">Alert message title</param>
    /// <param name="message">Alert message text</param>
    Task ShowAlert(string title, string message);
}
```

Building the ViewModel stub

Ok, we're gonna have the page class for Login screen, but let's start with ViewModel first:

```
public class LoginPageViewModel : BaseViewModel
{
    private readonly IAuthenticationService authenticationService;
    private readonly IAlertService alertService;

    private string userName;
    private string password;
    private bool isLoading;

    private ICommand loginCommand;

    public LoginPageViewModel(IAuthenticationService authenticationService, IAlertService
alertService)
    {
        this.authenticationService = authenticationService;
    }
}
```

```

        this.alertService = alertService;
    }

    public string UserName
    {
        get
        {
            return userName;
        }
        set
        {
            if (userName != value)
            {
                userName = value;
                OnPropertyChanged();
            }
        }
    }

    public string Password
    {
        get
        {
            return password;
        }
        set
        {
            if (password != value)
            {
                password = value;
                OnPropertyChanged();
            }
        }
    }

    public bool IsLoading
    {
        get
        {
            return isLoading;
        }
        set
        {
            if (isLoading != value)
            {
                isLoading = value;
                OnPropertyChanged();
            }
        }
    }

    public ICommand LoginCommand => loginCommand ?? (loginCommand = new Command(Login));

    private void Login()
    {
        authenticationService.Login(UserName, Password);
    }
}

```

We defined two `string` properties and a command to be bound on UI. We won't describe how to build a page class, XAML markup and bind ViewModel to it in this topic as they have nothing specific.

How to create a LoginPageViewModel instance?

I think you were probably creating the VMs just with constructor. Now as you can see our VM depends on 2 services being injected as constructor parameters so can't just do `var viewModel = new LoginPageViewModel()`. If you're not familiar with [Dependency Injection](#) it's the best moment to learn about it. Proper unit-testing is impossible without knowing and following this principle.

Tests

Now let's write some tests according to use cases listed above. First of all you need to create a new assembly (just a class library or select a special testing project if you want to use Microsoft unit testing tools). Name it something like `ProjectName.Tests` and add reference to your original PCL project.

In this example I'm going to use [NUnit](#) and [Moq](#) but you can go on with any testing libs of your choice. There will be nothing special with them.

Ok, that's the test class:

```
[TestFixture]
public class LoginPageViewModelTest
{
}
```

Writing tests

Here's the test methods for the first two scenarios. Try keeping 1 test method per 1 expected result and not to check everything in one test. That will help you to receive clearer reports about what has failed in the code.

```
[TestFixture]
public class LoginPageViewModelTest
{
    private readonly Mock<IAuthenticationService> authenticationServiceMock =
        new Mock<IAuthenticationService>();
    private readonly Mock<IAlertService> alertServiceMock =
        new Mock<IAlertService>();

    [TestCase("user", "pass")]
    public void LogInWithValidCreds_LoadingIndicatorShown(string userName, string password)
    {
        LoginPageViewModel model = CreateViewModelAndLogin(userName, password);

        Assert.IsTrue(model.IsLoading);
    }

    [TestCase("user", "pass")]
    public void LogInWithValidCreds_AuthenticationRequested(string userName, string password)
    {
        CreateViewModelAndLogin(userName, password);

        authenticationServiceMock.Verify(x => x.Login(userName, password), Times.Once);
    }

    [TestCase("", "pass")]
    [TestCase(" ", "pass")]
    [TestCase(null, "pass")]
    public void LogInWithEmptyuserName_AuthenticationNotRequested(string userName, string password)
    {
        CreateViewModelAndLogin(userName, password);
    }
}
```

```

        authenticationServiceMock.Verify(x => x.Login(It.IsAny<string>(), It.IsAny<string>()),
Times.Never);
    }

    [TestCase("", "pass", "Please, enter correct username and password")]
    [TestCase(" ", "pass", "Please, enter correct username and password")]
    [TestCase(null, "pass", "Please, enter correct username and password")]
    public void LoginWithEmptyUserName_AlertMessageShown(string userName, string password, string
message)
    {
        CreateViewModelAndLogin(userName, password);

        alertServiceMock.Verify(x => x.ShowAlert(It.IsAny<string>(), message));
    }

    private LoginPageViewModel CreateViewModelAndLogin(string userName, string password)
    {
        var model = new LoginPageViewModel(
            authenticationServiceMock.Object,
            alertServiceMock.Object);

        model.UserName = userName;
        model.Password = password;

        model.LoginCommand.Execute(null);

        return model;
    }
}

```

And here we go:

```

▲  LoginPageViewModelTest (8 tests)
  ▲  LoginWithValidCreds_LoadingIndicatorShown (1 test)
     LoginWithValidCreds_LoadingIndicatorShown("user","pass")
  ▲  LoginWithValidCreds_AuthenticationRequested (1 test)
     LoginWithValidCreds_AuthenticationRequested("user","pass")
  ▲  LoginWithEmptyuserName_AuthenticationNotRequested (3 tests)
     LoginWithEmptyuserName_AuthenticationNotRequested("", "pass")
     LoginWithEmptyuserName_AuthenticationNotRequested(" ", "pass")
     LoginWithEmptyuserName_AuthenticationNotRequested(null, "pass")
  ▲  LoginWithEmptyUserName_AlertMessageShown (3 tests)
     LoginWithEmptyUserName_AlertMessageShown("", "pass", "Please, enter correct username and password")
     LoginWithEmptyUserName_AlertMessageShown(" ", "pass", "Please, enter correct username and password")
     LoginWithEmptyUserName_AlertMessageShown(null, "pass", "Please, enter correct username and password")

```

Now the goal is to write correct implementation for ViewModel's Login method and that's it.

Business logic implementation

```

private async void Login()
{
    if (String.IsNullOrWhiteSpace(Username) || String.IsNullOrWhiteSpace>Password))
    {
        await alertService.ShowAlert("Warning", "Please, enter correct username and password");
    }
    else
    {
        IsLoading = true;
    }
}

```

```
    bool isAuthenticated = await authenticationService.Login(UserName, Password);  
  }  
}
```

And after running the tests again:

- ▲ ✓ LoginPageViewModelTest (8 tests)
 - ▲ ✓ LogInWithValidCreds_LoadingIndicatorShown (1 test)
 - ✓ LogInWithValidCreds_LoadingIndicatorShown("user","pass")
 - ▲ ✓ LogInWithValidCreds_AuthenticationRequested (1 test)
 - ✓ LogInWithValidCreds_AuthenticationRequested("user","pass")
 - ▲ ✓ LogInWithEmptyuserName_AuthenticationNotRequested (3 tests)
 - ✓ LogInWithEmptyuserName_AuthenticationNotRequested("", "pass")
 - ✓ LogInWithEmptyuserName_AuthenticationNotRequested(" ", "pass")
 - ✓ LogInWithEmptyuserName_AuthenticationNotRequested(null, "pass")
 - ▲ ✓ LogInWithEmptyUserName_AlertMessageShown (3 tests)
 - ✓ LogInWithEmptyUserName_AlertMessageShown("", "pass", "Please, enter correct username and password")
 - ✓ LogInWithEmptyUserName_AlertMessageShown(" ", "pass", "Please, enter correct username and password")
 - ✓ LogInWithEmptyUserName_AlertMessageShown(null, "pass", "Please, enter correct username and password")

Now you can keep covering your code with new tests making it more stable and regression-safe.

Chapter 37: BDD Unit Testing in Xamarin.Forms

Section 37.1: Simple Specflow to test commands and navigation with NUnit Test Runner

Why do we need this?

The current way to do unit testing in Xamarin.Forms is via a platform runner, so your test will have to run within an ios, android, windows or mac UI environment : [Running Tests in the IDE](#)

Xamarin also provides awesome UI testing with the [Xamarin.TestCloud](#) offering, but when wanting to implement BDD dev practices, and have the ability to test ViewModels and Commands, while running cheaply on a unit test runners locally or on a build server, there is not built in way.

I developed a library that allows to use Specflow with Xamarin.Forms to easily implement your features from your Scenarios definitions up to the ViewModel, independently of any MVVM framework used for the App (such as [XLabs](#), [MVVMCross](#), [Prism](#))

If you are new to BDD, check [Specflow](#) out.

Usage:

- If you don't have it yet, install the specflow visual studio extension from here (or from you visual studio IDE): <https://visualstudiogallery.msdn.microsoft.com/c74211e7-cb6e-4dfa-855d-df0ad4a37dd6>
- Add a Class library to your Xamarin.Forms project. That's your test project.
- Add SpecFlow.Xamarin.Forms package from [nuget](#) to your test projects.
- Add a class to you test project that inherits 'TestApp', and register your views/viewmodels pairs as well as adding any DI registration, as per below:

```
public class DemoAppTest : TestApp
{
    protected override void SetViewModelMapping()
    {
        TestViewFactory.EnableCache = false;

        // register your views / viewmodels below
        RegisterView<MainPage, MainViewModel>();
    }

    protected override void InitialiseContainer()
    {
        // add any di registration here
        // Resolver.Instance.Register<TInterface, TType>();
        base.InitialiseContainer();
    }
}
```

- Add a SetupHook class to your test project, in order to add you Specflow hooks. You will need to bootstrap the test application as per below, providing the class you created above, and the your app initial viewmodel:

```
[Binding]
public class SetupHooks : TestSetupHooks
```

```

{
    /// <summary>
    ///     The before scenario.
    /// </summary>
    [BeforeScenario]
    public void BeforeScenario()
    {
        // bootstrap test app with your test app and your starting viewmodel
        new TestAppBootstrap().RunApplication<DemoAppTest, MainViewModel>();
    }
}

```

- You will need to add a catch block to your xamarin.forms views codebehind in order to ignore xamarin.forms framework forcing you to run the app ui (something we don't want to do):

```

public YourView()
{
    try
    {
        InitializeComponent();
    }
    catch (InvalidOperationException soe)
    {
        if (!soe.Message.Contains("MUST"))
            throw;
    }
}

```

- Add a specflow feature to your project (using the vs specflow templates shipped with the vs specflow extension)
- Create/Generate a step class that inherits TestStepBase, passing the scenarioContext parameter to the base.
- Use the navigation services and helpers to navigate, execute commands, and test your view models:

```

[Binding]
public class GeneralSteps : TestStepBase
{
    public GeneralSteps(ScenarioContext scenarioContext)
        : base(scenarioContext)
    {
        // you need to instantiate your steps by passing the scenarioContext to the base
    }

    [Given(@"I am on the main view")]
    public void GivenIAmOnTheMainView()
    {
        Resolver.Instance.Resolve<INavigationService>().PushAsync<MainViewModel>();

        Resolver.Instance.Resolve<INavigationService>().CurrentViewModelType.ShouldEqualType<MainViewModel>();
    }

    [When(@"I click on the button")]
    public void WhenIClickOnTheButton()
    {
        GetCurrentViewModel<MainViewModel>().GetTextCommand.Execute(null);
    }

    [Then(@"I can see a Label with text ""(.*)""")]
    public void ThenICanSeeALabelWithText(string text)

```

```
{
    GetCurrentViewModel<MainViewModel>().Text.ShouldEqual(text);
}
}
```

Section 37.2: Advanced Usage for MVVM

To add to the first example, in order to test navigation statements that occurs within the application, we need to provide the ViewModel with a hook to the Navigation. To achieve this:

- Add the package `SpecFlow.Xamarin.Forms.IViewModel` from [nuget](#) to your PCL Xamarin.Forms project
- Implement the `IViewModel` interface in your ViewModel. This will simply expose the `Xamarin.Forms.INavigation` property:
- `public class MainViewModel : INotifyPropertyChanged, IViewModel.IViewModel { public INavigation Navigation { get; set; } }`
- The test framework will pick that up and manage internal navigation
- You can use any MVVM frameworks for you application (such as [XLabs](#), [MVVMCross](#), [Prism](#) to name a few. As long as the `IViewModel` interface is implemented in your ViewModel, the framework will pick it up.


Credits

Thank you greatly to all the people from Stack Overflow Documentation who helped provide this content, more changes can be sent to web@petercv.com for new content to be published or updated

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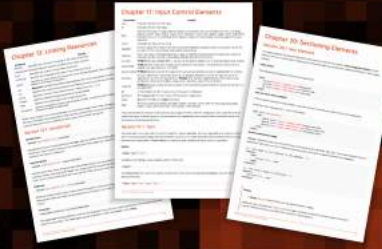


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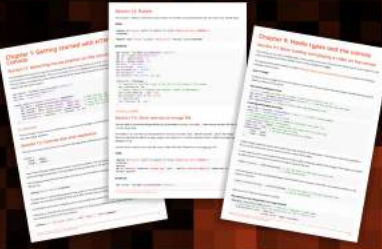


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