XAM 120

Introduction to Xamarin.Forms

- Lecture will begin shortly
- Download class materials from university.xamarin.com

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Objectives

1. What is Xamarin.Forms?
2. Pages, Controls, and Layout
3. Using Platform-Specific Features

What is Xamarin.Forms?

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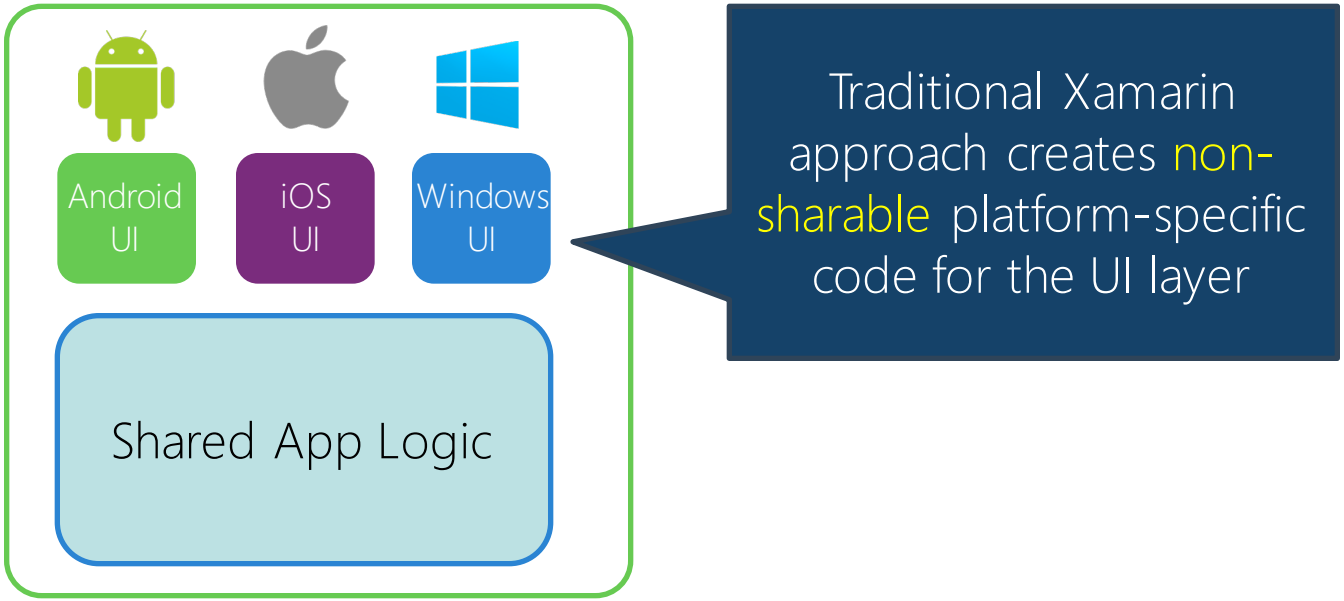
Tasks

- Traditional vs. Xamarin.Forms
- Xamarin.Forms project structure
- Application Components
- "Hello, Forms!"

Reminder: Traditional Xamarin approach



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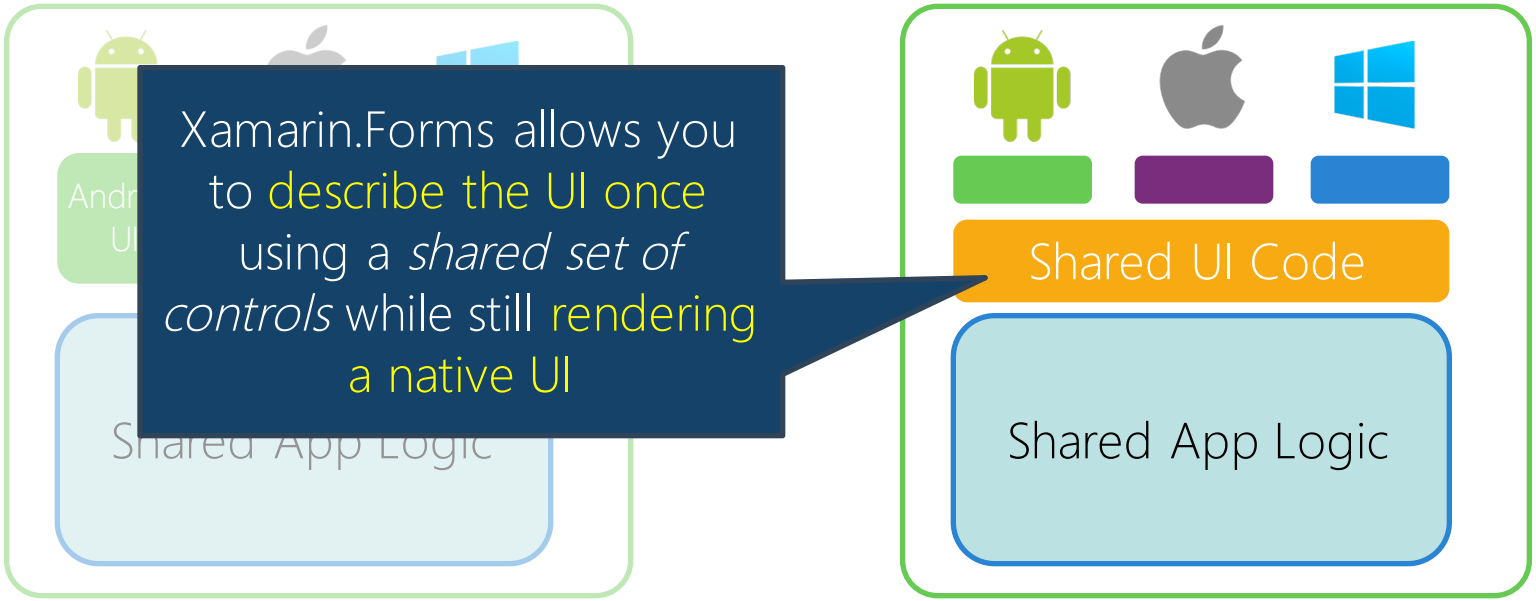
Traditional vs. Xamarin.Forms



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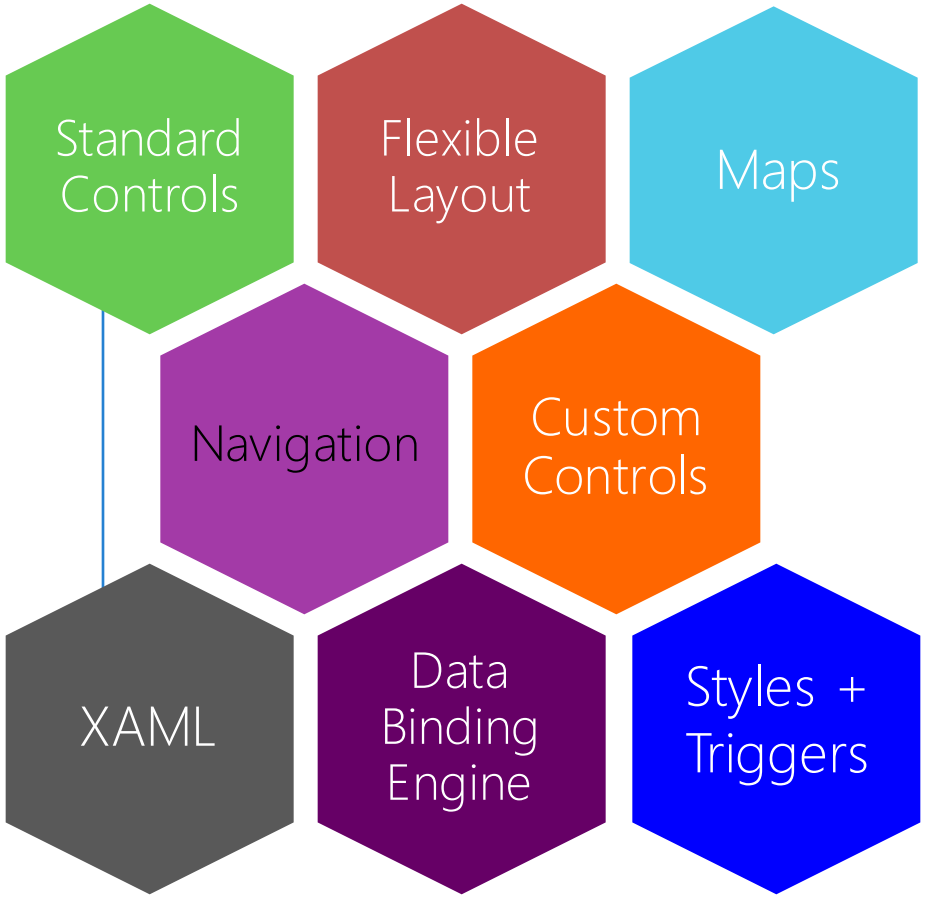
What is Xamarin.Forms?

- Xamarin.Forms is a cross-platform UI framework to create mobile apps for:
  - Android 4.0+
  - iOS 6.1+
  - Windows Phone 8.x (SL)
  - Windows Phone 8.1 (RT)
  - Windows 10 (UWP)



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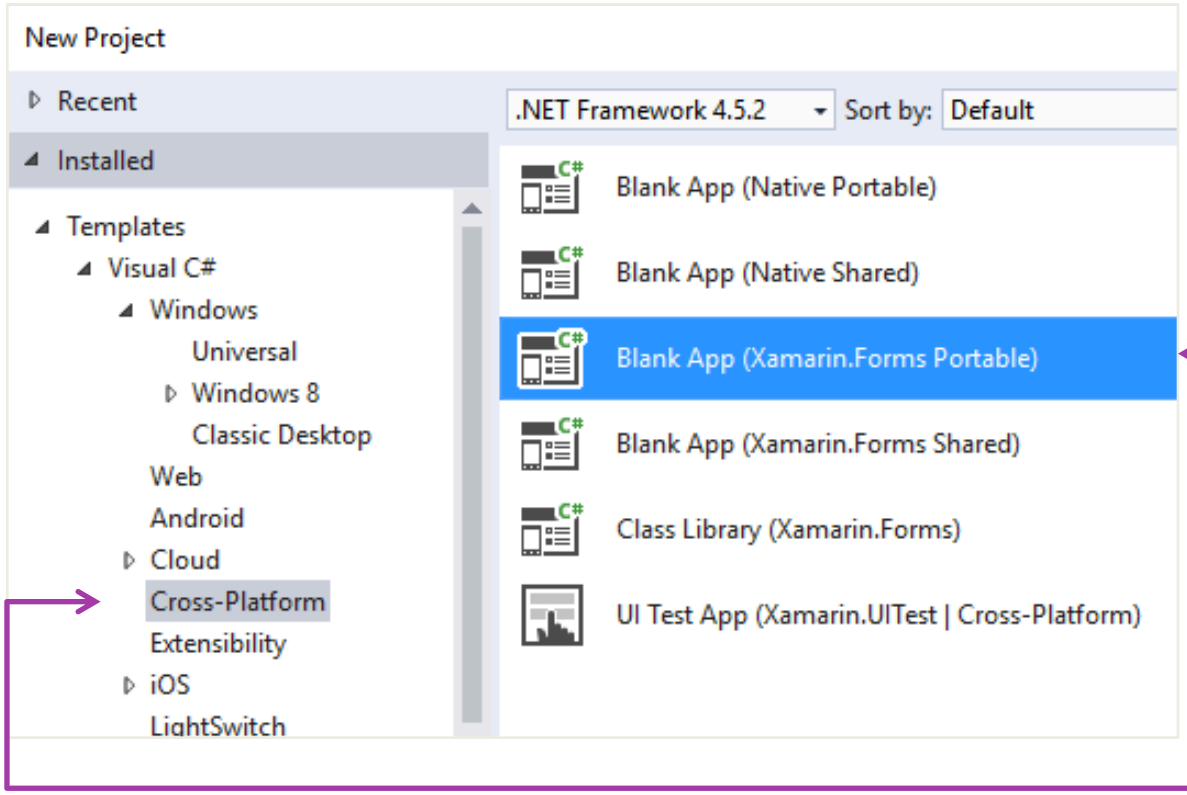
Creating a Xamarin.Forms App [VS]



Built-in project templates for Xamarin.Forms applications available under **Cross-Platform**

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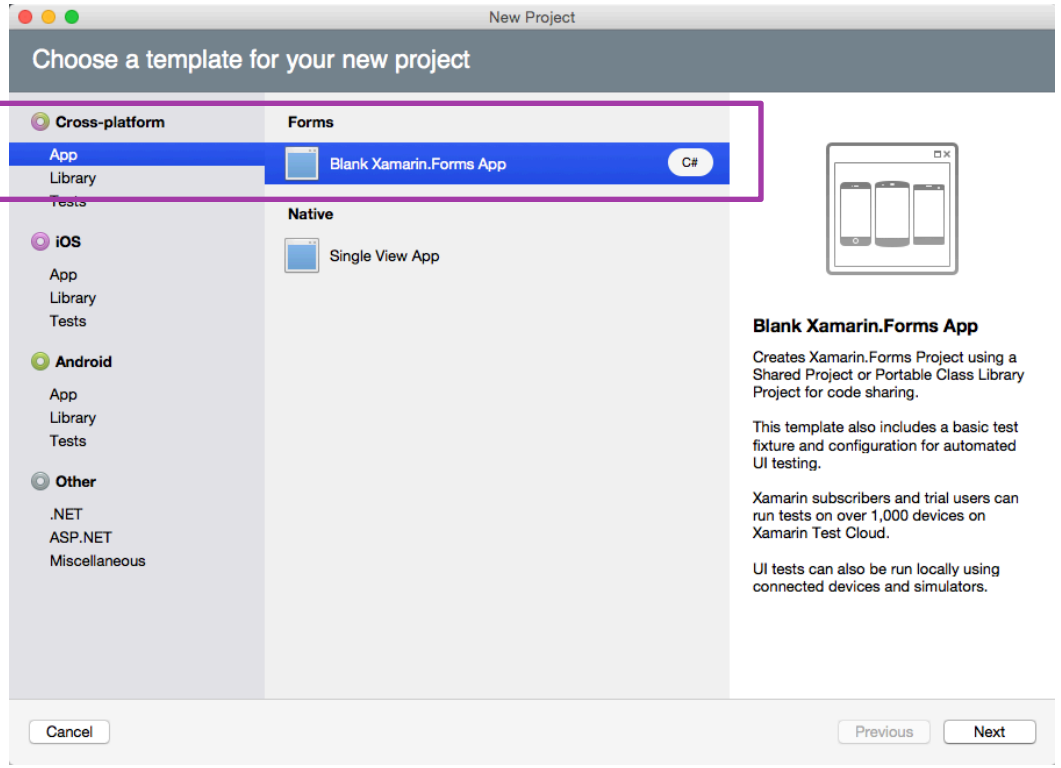
Creating a Xamarin.Forms App [XS]

- ❖ Project wizard walks through the available options

- ✓ Mac supports Android + iOS
- ✓ Windows supports Android



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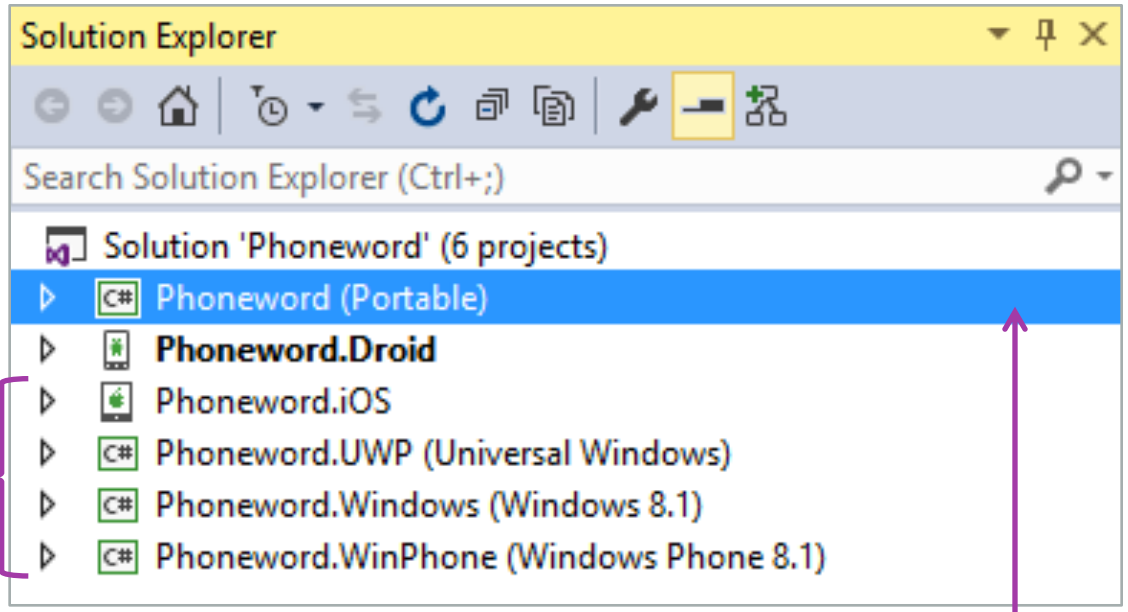
Project Structure

- Blank App project template creates several related projects



Platform-specific projects act as "host" to create native application

PCL or SAP used to hold shared code that defines UI and logic

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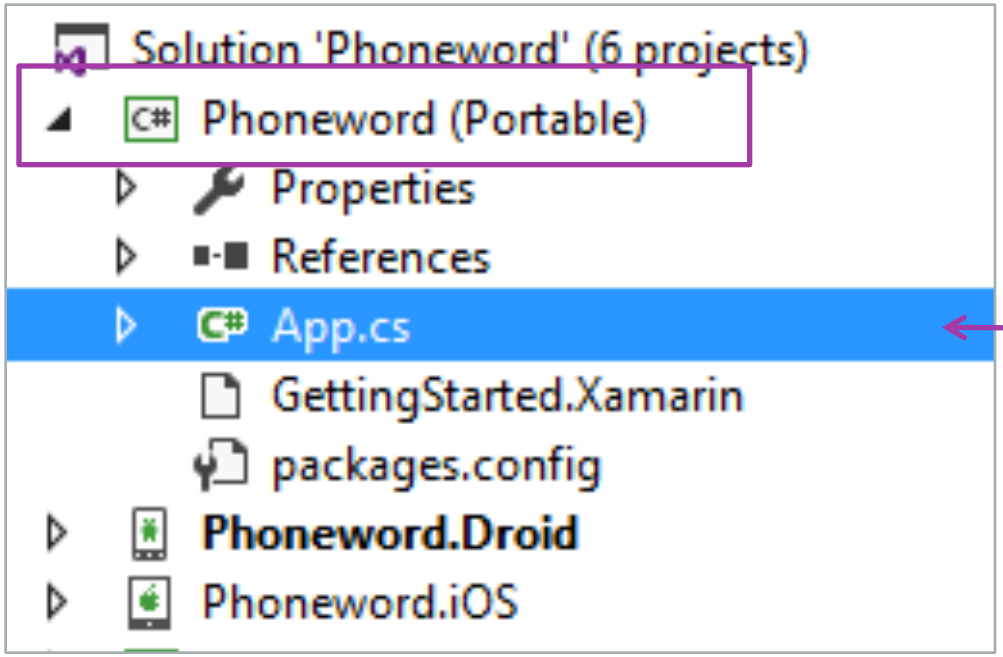
Project Structure - PCL

- Most of your code will go into the PCL used for shared logic + UI



Default template creates a single **`App.cs`** file which decides the initial screen for the application

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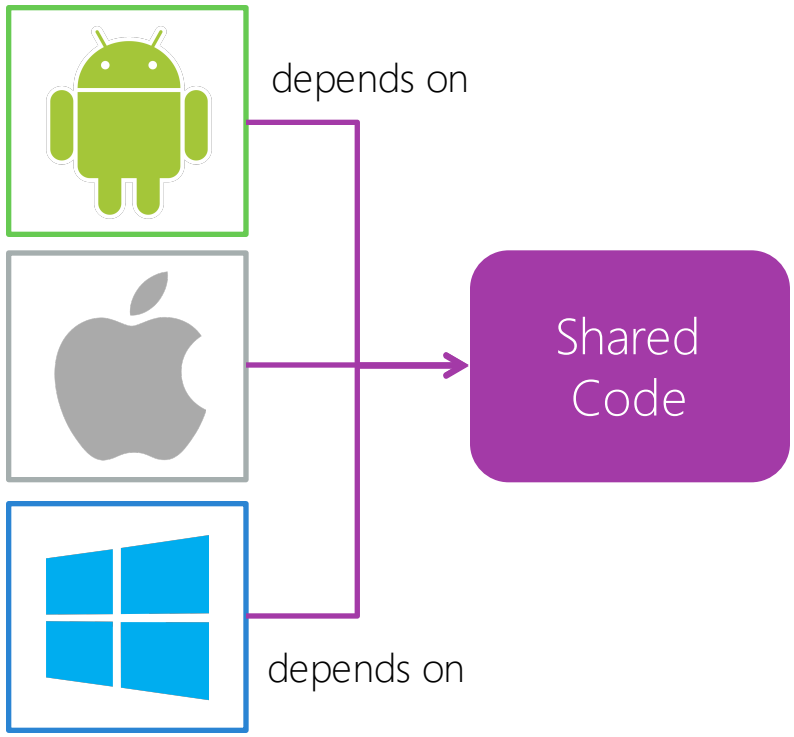
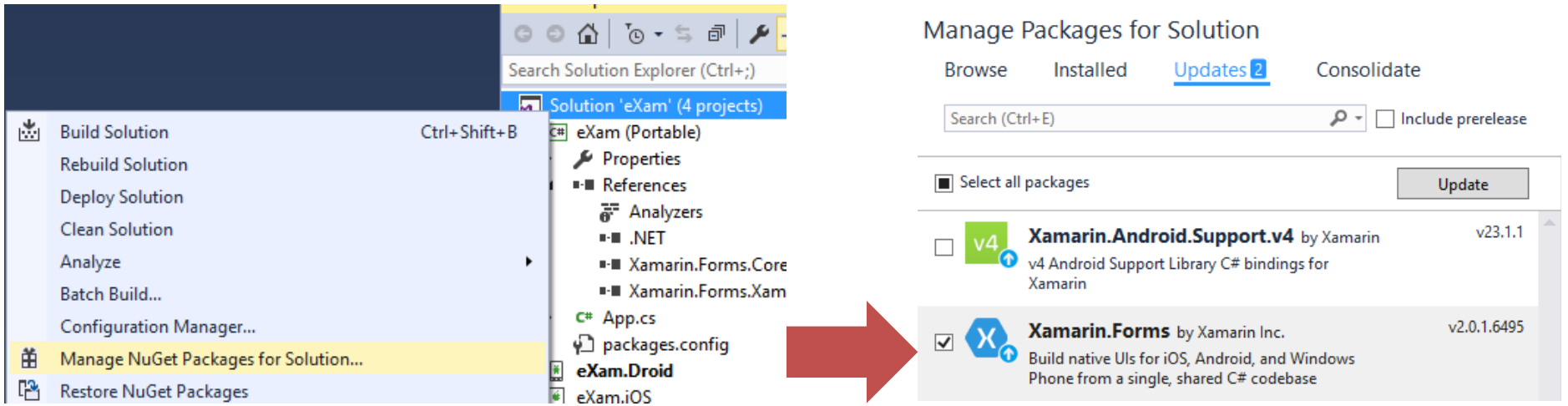
Project Structure - Dependencies

- Platform-specific projects depend on the shared code (PCL or SAP), but *not* the other way around
- Xamarin.Forms defines the UI and behavior in the PCL or SAP (shared) and then calls it from each platform-specific project



Xamarin.Forms updates

- Should update Xamarin.Forms **Nuget package** when starting a new project



Visual Studio 2015

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Xamarin.Forms updates

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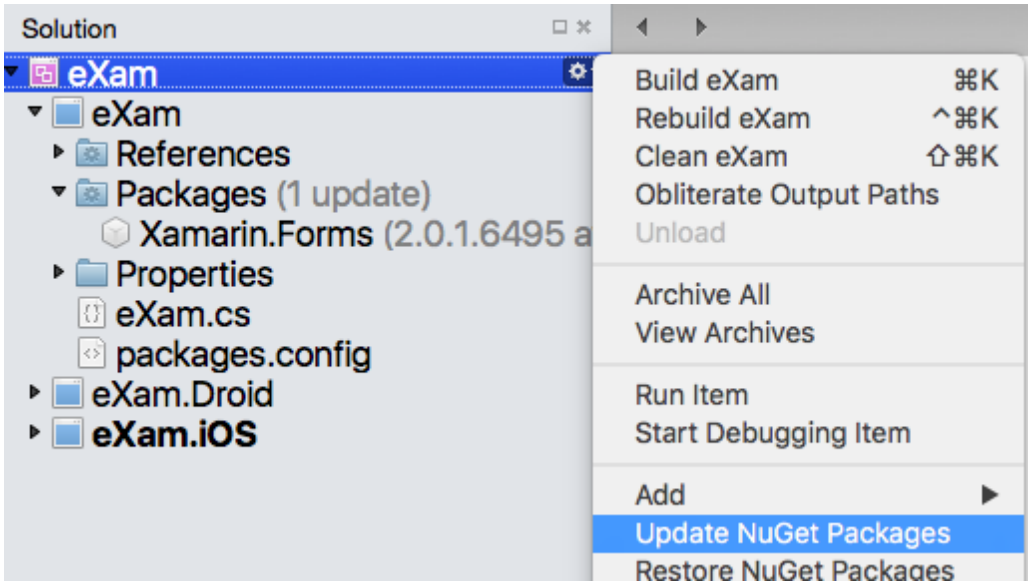

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Demonstration

Creating a Xamarin.Forms application

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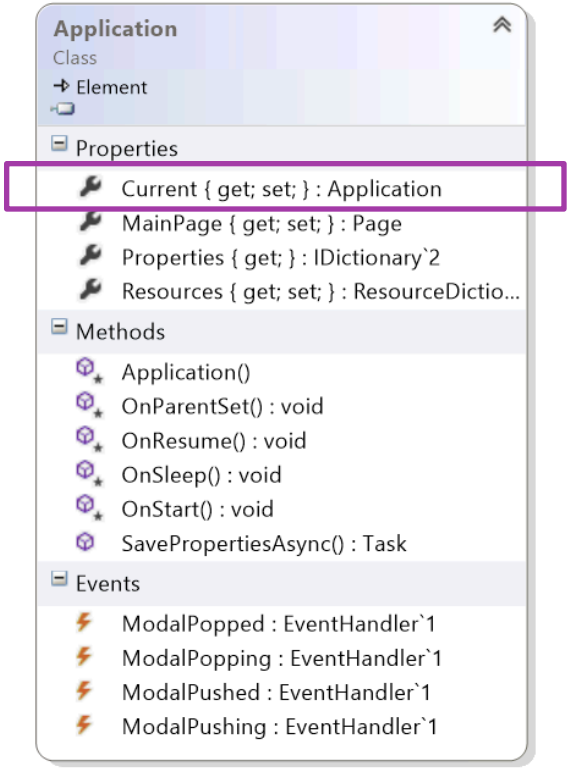
Xamarin.Forms app anatomy

- Xamarin.Forms applications have two required components which are provided by the template

Xamarin.Forms Application

- **`Application`** class provides a *singleton* which manages:
  - Lifecycle methods
  - Modal navigation notifications
  - Currently displayed page
  - Application state persistence

- New projects will have a derived implementation named **`App`**



Note: Windows apps *also* have an **`Application`** class, make sure not to confuse them!

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Xamarin.Forms Application

- **`Application`** class provides lifecycle methods which can be used to manage persistence and refresh your data

```
public class App : Application
{
    // Handle when your app starts
    protected override void OnStart() {}
    // Handle when your app sleeps
    protected override void OnSleep() {}
    // Handle when your app resumes
    protected override void OnResume() {}
}
```

Use **`OnStart`** to initialize and/or reload your app's data

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Xamarin.Forms Application

- **`Application`** class provides lifecycle methods which can be used to manage persistence and refresh your data

```
public class App : Application
{
    // Handle when your app starts
    protected override void OnStart() {}
    // Handle when your app sleeps
    protected override void OnSleep() {}
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    protected override void OnResume() {}
}
```

Use **`OnSleep`** to save changes or persist information the user is working on

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Xamarin.Forms Application

- **`Application`** class provides lifecycle methods which can be used to manage persistence and refresh your data

```
public class App : Application
{
    // Handle when your app starts
    protected override void OnStart() {}
    // Handle when your app sleeps
    protected override void OnSleep() {}
    // Handle when your app resumes
    protected override void OnResume() {}
}
```

Use **`OnResume`** to refresh your displayed data

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Persisting information

- **`Application`** class also includes a **`string`** >> **`object`** property bag which is persisted between app launches

```
// Save off username in global property bag
Application.Current.Properties["username"] = username.Text;
```

```
// Restore the username before it is displayed
if (Application.Current.Properties.ContainsKey("username")) {
    var uname = Application.Current.Properties["username"] as string
                    ?? "";
    username.Text = uname;
}
```

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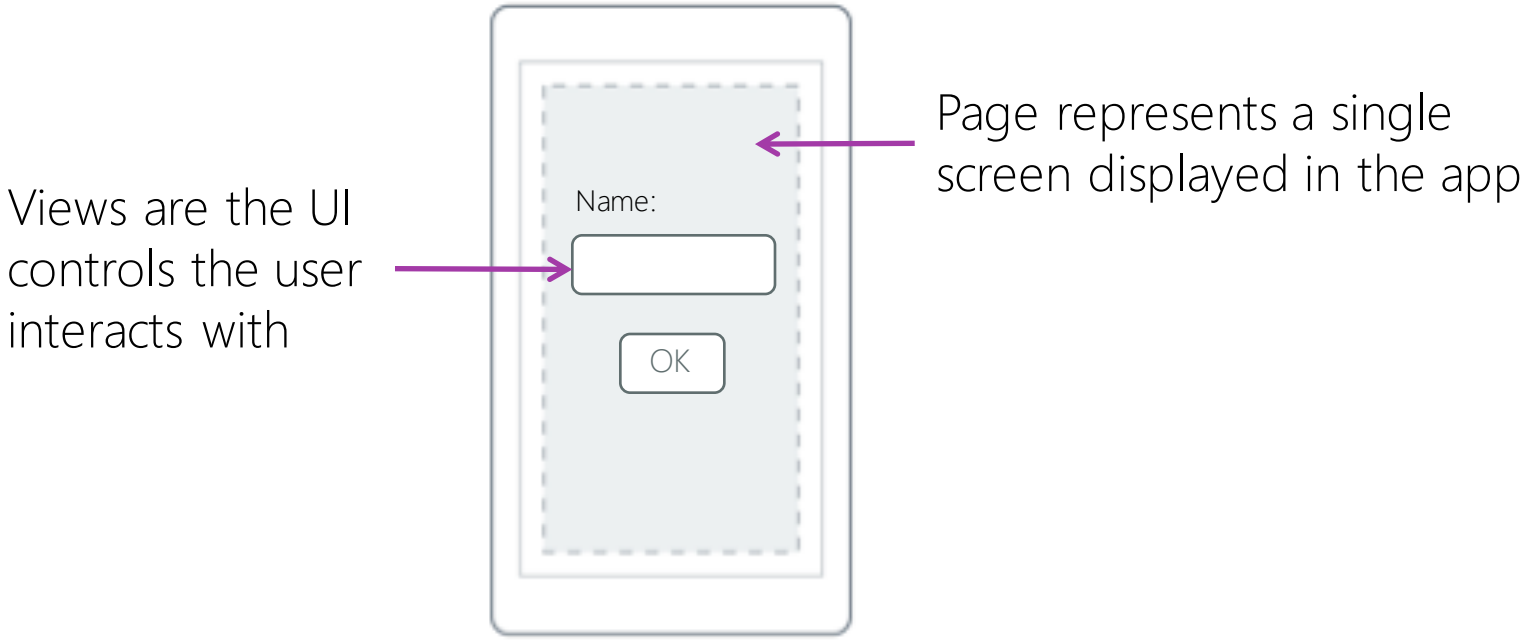
Creating the application UI

- Application UI is defined in terms of *pages* and *views*



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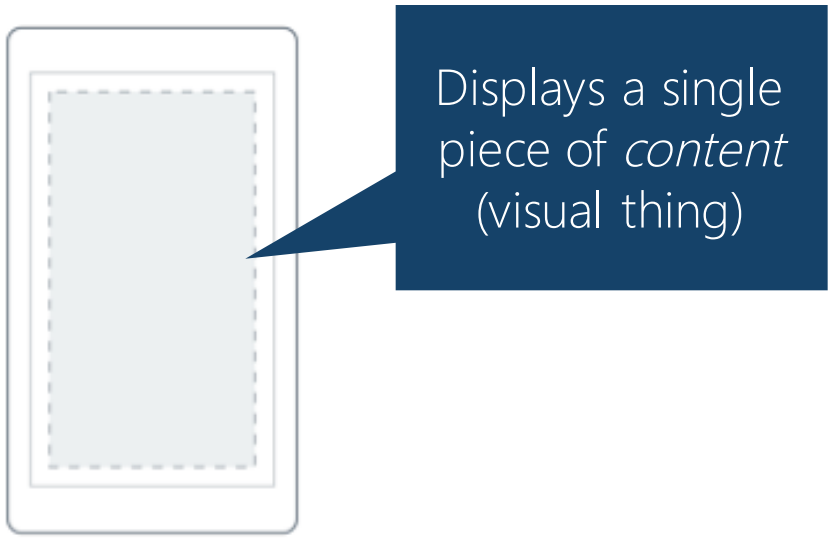
Pages

- **Page** is an abstract class used to define a single screen of content
  - derived types provide specific visualization / behavior



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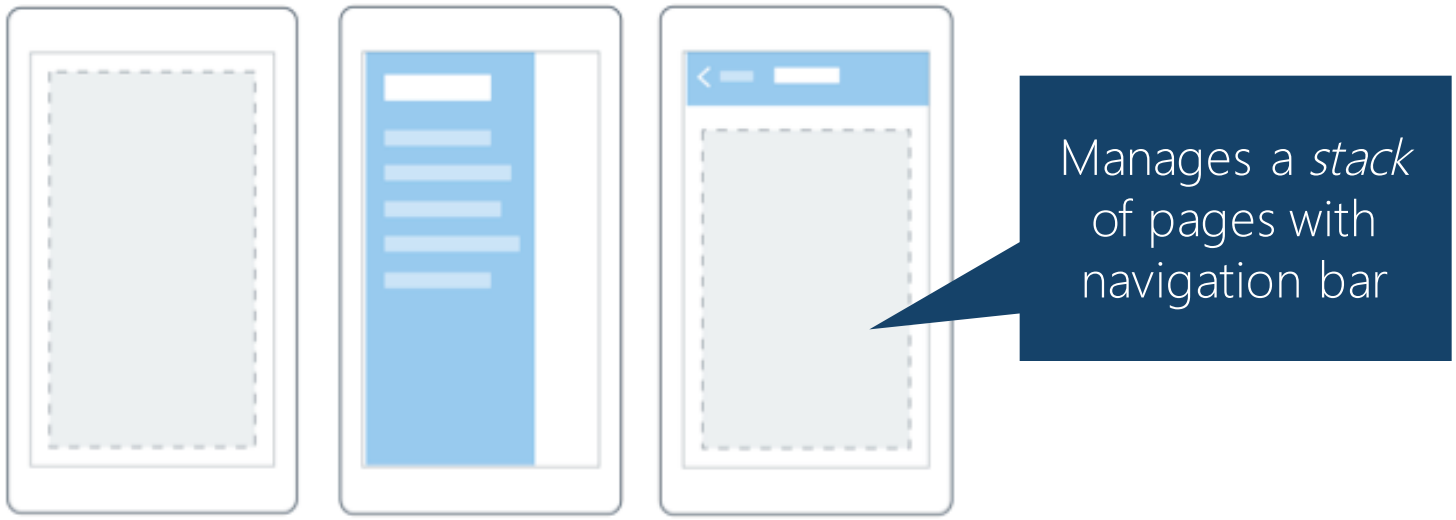

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Pages

- **Page** is an abstract class used to define a single screen of content
  - derived types provide specific visualization / behavior

Demonstration

Adding a new ContentPage to a Xamarin.Forms application

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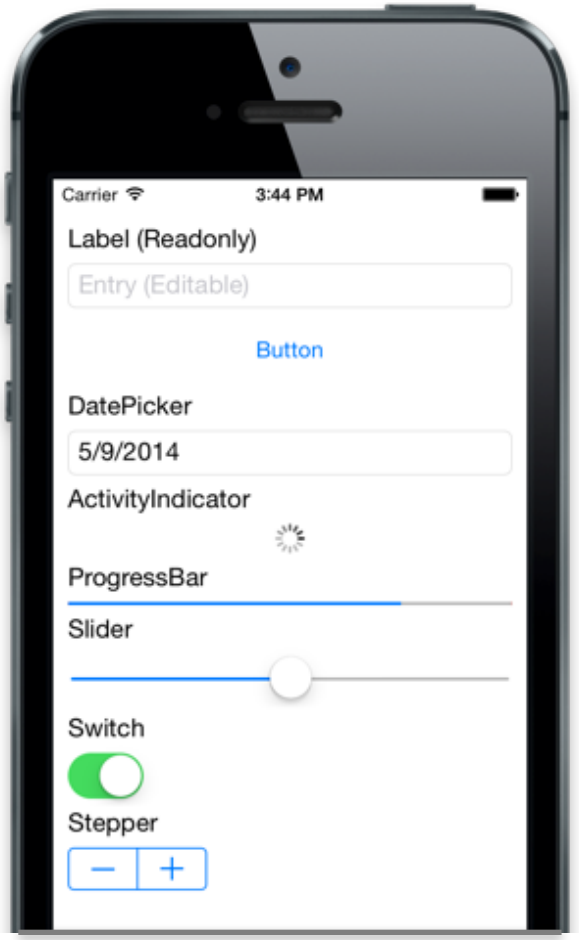
Views

- View is the base class for all visual controls, most standard controls are present

Label	Image	SearchBar
Entry	ProgressBar	ActivityIndicator
Button	Slider	OpenGLView
Editor	Stepper	WebView
DatePicker	Switch	ListView
BoxView	TimePicker	
Frame	Picker	



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Views - Button

- **`Button`** provides a clickable surface with text


```
Button okButton = new Button() {
    Text = "Button"
};
okButton.Clicked += OnClick;
```

```
void OnClick(object sender, EventArgs e) {
  ...
}
```

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Views - Label

- Use a **`Label`** to display read-only text blocks

Hello, Forms!

```
Label hello = new Label() {
    Text = "Hello, Forms!",
    HorizontalTextAlignment = TextAlignment.Center,
    TextColor = Color.Blue,
    FontFamily = "Arial"
};
```

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Views - Entry

- Use an **`Entry`** control if you want the user to provide input with an on-screen or hardware keyboard


```
Entry edit = new Entry() {
    Text = "Hello",
    Keyboard = Keyboard.Text,
    PlaceholderText = "Enter Text"
};
```

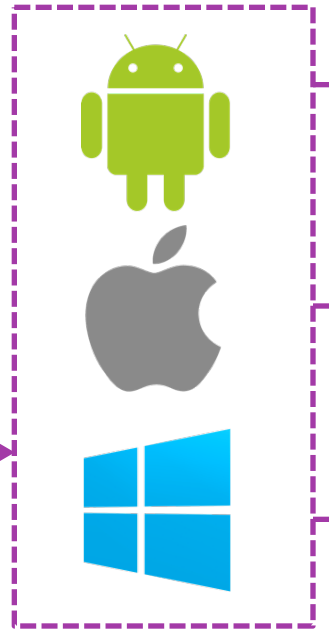
Rendering views

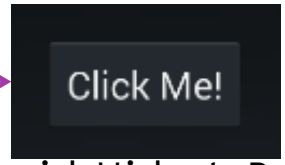
- Platform defines a *renderer* for each view that creates a native representation of the UI

UI uses a Xamarin.Forms `Button`

```
Button button = new Button {
    Text = "Click Me!"
};
```

Platform Renderer takes view and turns it into platform-specific control





Android.Widget.Button

UIButton

System.Windows.Button

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Visual adjustments

- Views utilize **properties** to adjust visual appearance and behavior

```
Entry numEntry = new Entry {
    Placeholder = "Enter Number",
    Keyboard = Keyboard.Numeric
};

Button callButton = new Button {
    Text = "Call",
    BackgroundColor = Color.Blue,
    TextColor = Color.White
};
```

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Providing Behavior

- Controls use events to provide interaction behavior, should be very familiar model for most .NET developers

```
Entry numEntry = new Entry { ... };
numEntry.TextChanged += OnTextChanged;
...

void OnTextChanged (object sender, string newValue)
{
    ...
}
```

You can use traditional delegates, anonymous methods, or lambdas to handle events

Group Exercise

Creating our first Xamarin.Forms application

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Flash Quiz

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Flash Quiz

① Xamarin.Forms creates a single binary that can be deployed to Android, iOS or Windows Phone

a) True

b) False

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Flash Quiz

① Xamarin.Forms creates a single binary that can be deployed to Android, iOS or Windows Phone

a) True

b) False

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Flash Quiz

② You must call _____ before using Xamarin.Forms

a) Forms.Initialize
b) Forms.Init
c) Forms.Setup
d) No setup call necessary.

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Flash Quiz

② You must call _____ before using Xamarin.Forms

a) Forms.Initialize

b) Forms.Init

c) Forms.Setup

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Flash Quiz

③ To supply the initial page for the application, you must set the _____ property.

a) Application.FirstPage
b) Application.PrimaryPage
c) Application.MainPage
d) Application.MainView

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Flash Quiz

③ To supply the initial page for the application, you must set the _____ property.

a) Application.FirstPage

b) Application.PrimaryPage

c) Application.MainPage

d) Application.MainView

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Summary

- Xamarin.Forms project structure
- Application Components
- "Hello, Forms!"

Pages, Controls, and Layout

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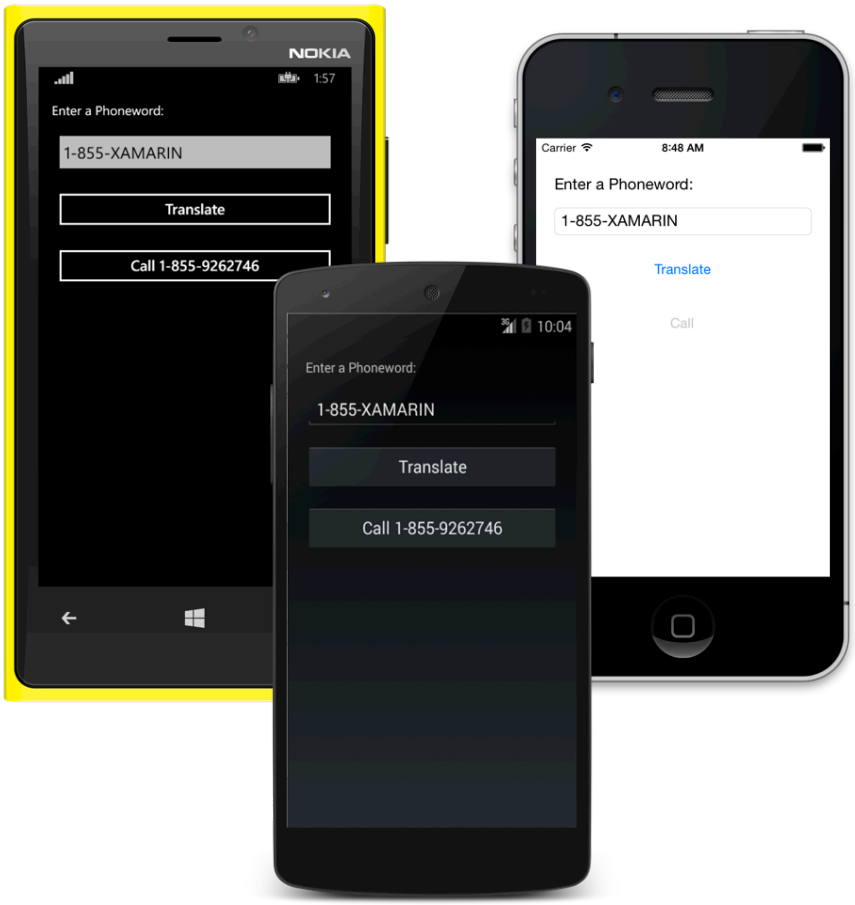
Tasks

- Layout containers
- Adding views
- Fine-tuning layout



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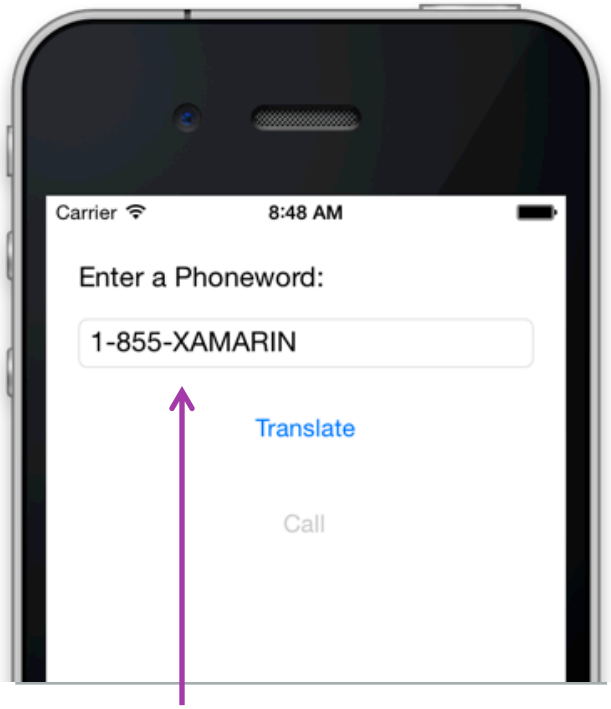
Organizing content

- Rather than specifying positions with coordinates (pixels, dips, etc.), you use layout containers to control how views are positioned relative to each other

- This provides for a more a*daptive* layout which is not as sensitive to dimensions and resolutions



For example, "stacking" views on top of each other with some spacing between them

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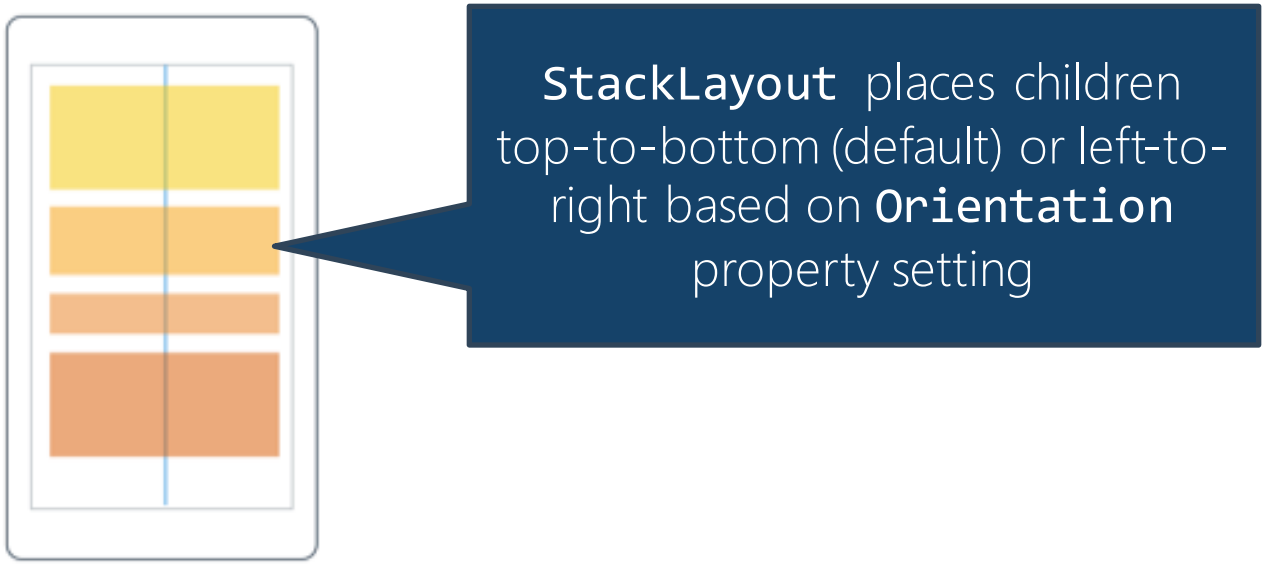
Layout containers

- *Layout Containers* organize child elements based on specific rules



StackLayout

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Layout containers

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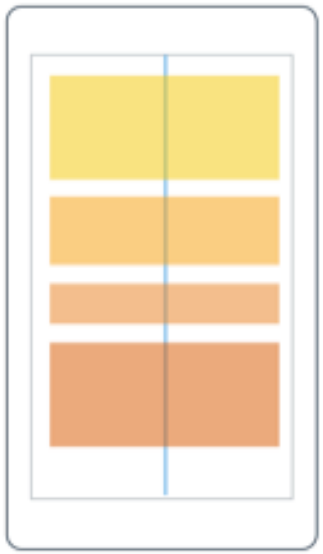
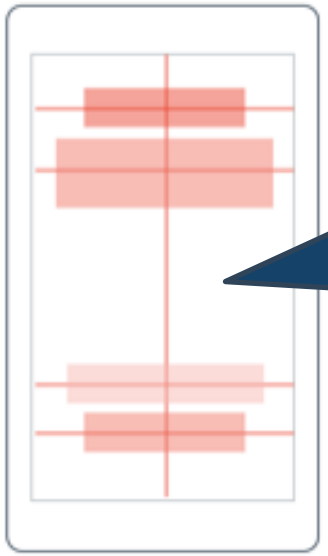


StackLayout



AbsoluteLayout

`AbsoluteLayout` places children in absolute requested positions based on anchors and bounds

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Layout containers

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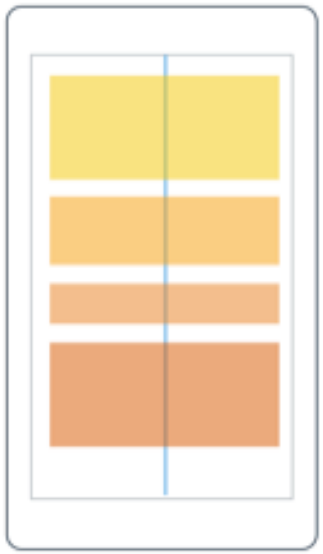
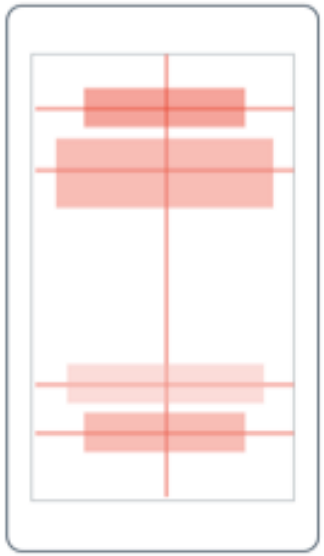
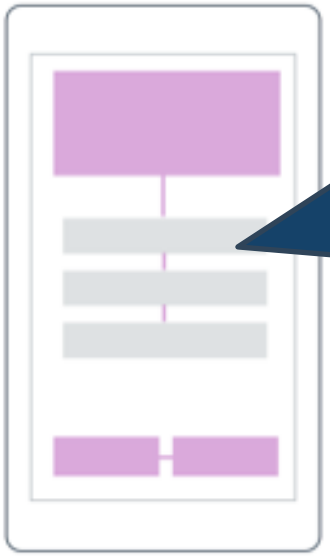


StackLayout



Absolute Layout



Relative Layout

`RelativeLayout` uses constraints to position the children

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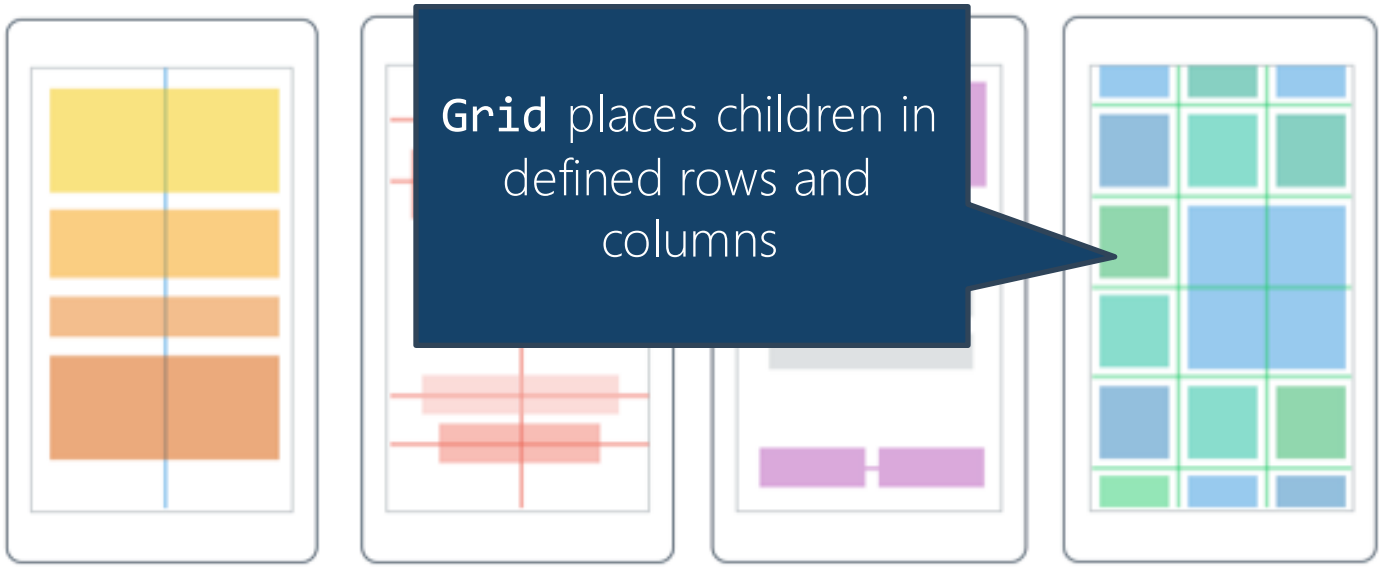
Layout containers

- *Layout Containers* organize child elements based on specific rules



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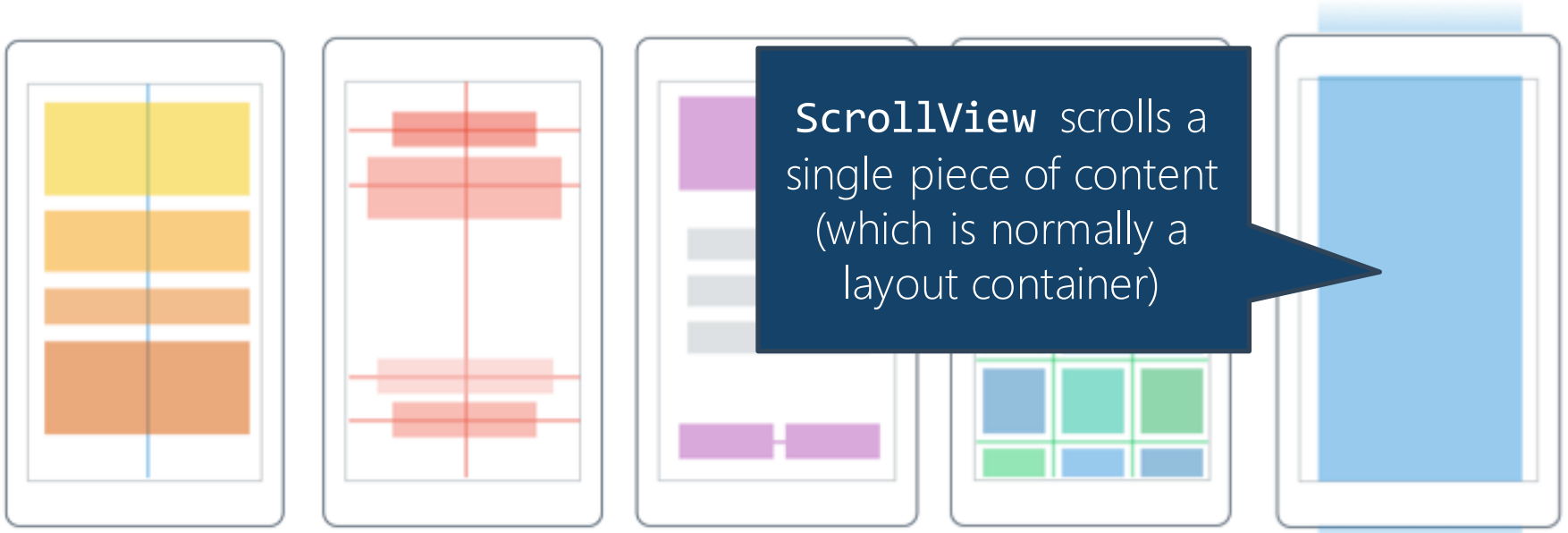

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Adding views to layout containers

- Layout containers have a **`Children`** collection property which is used to hold the views that will be organized by the container

```
Label label = new Label { Text = "Enter Your Name" };
Entry nameEntry = new Entry();

StackLayout layout = new StackLayout();
layout.Children.Add(label);
layout.Children.Add(nameEntry);

this.Content = layout;
```

Views are laid out and rendered in the order they appear in the collection

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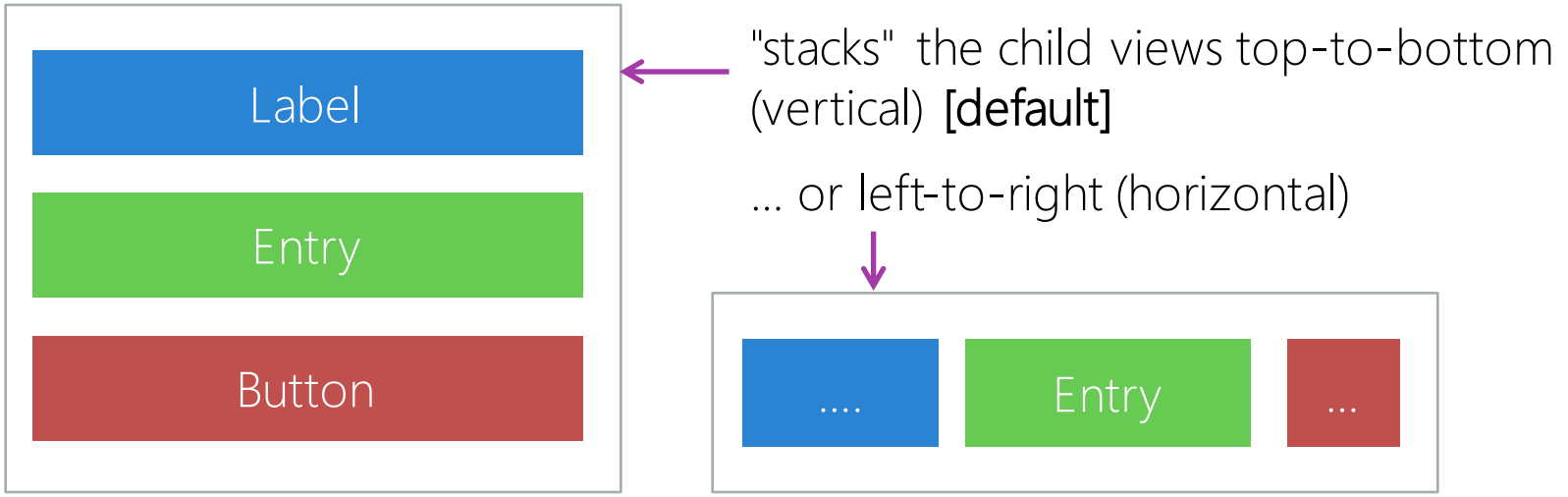
Working with StackLayout

- **`StackLayout`** is used to create typical form style layout



The **`Orientation`** property can be set to either **`Horizontal`** or **`Vertical`** to control which direction the child views are stacked in

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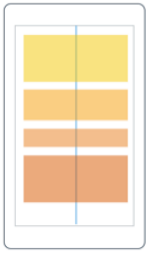
Working with StackLayout

- `StackLayout` is used to create typical form style layout, `Orientation` property decides the direction that children are stacked



```
var layout = new StackLayout {
    Orientation = StackOrientation.Vertical
};

layout.Children.Add(new Label { Text = "Enter your name:" });
layout.Children.Add(new Entry());
layout.Children.Add(new Button { Text = "OK" });
```

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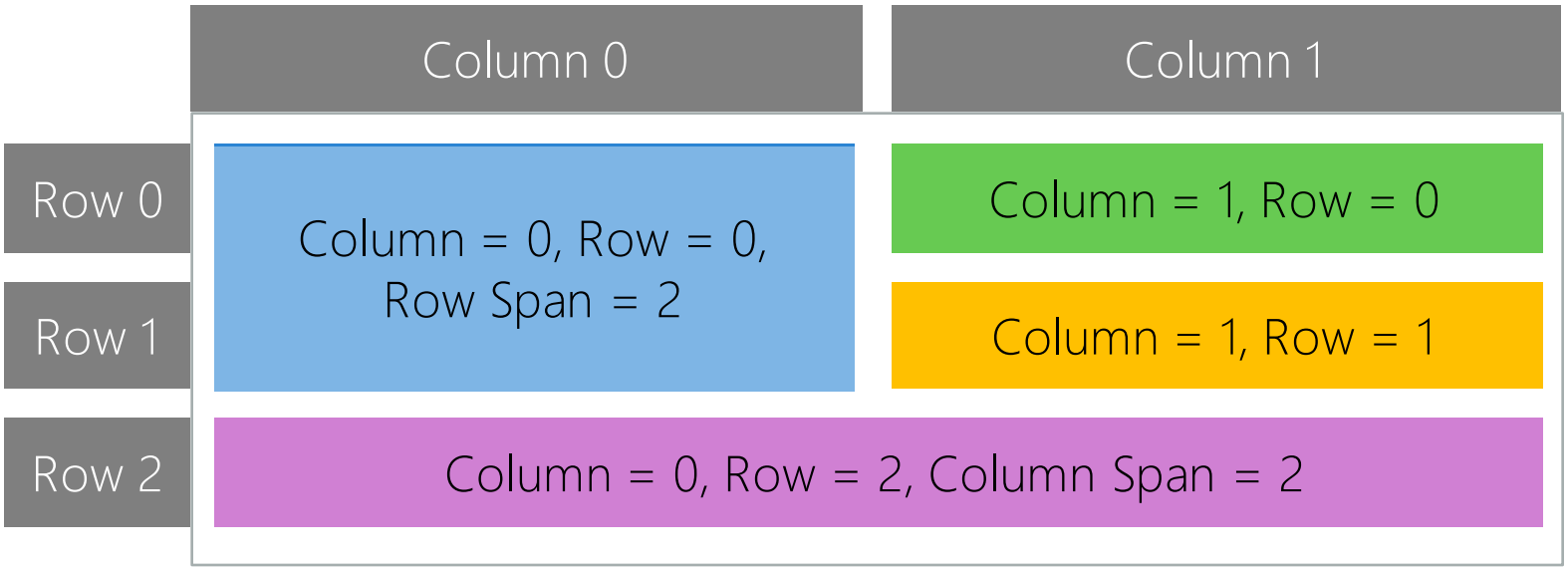
Working with Grid

- **`Grid`** is used to create rows and columns of information, children identify specific column, row and span



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Adding items to a Grid

- Children in **`Grid`** must specify the layout properties, or they will default to the first column/row

```
Label label = new Label { Text = "Enter Your Name" };

Grid layout = new Grid();
layout.Children.Add(label);

Grid.SetColumn(label, 1);
Grid.SetRow(label, 1);
Grid.SetColumnSpan(label, 2);
Grid.SetRowSpan(label, 1);
```

Use static methods defined on **`Grid`** to set layout properties

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Adding items to a Grid

- Children in **Grid** must specify the layout properties, or they will default to the first column/row

```
Grid layout = new Grid();

...

layout.Children.Add(label, 0, 1);           // Left=0 and Top=1
layout.Children.Add(button, 0, 2, 2, 2);    // L=0, R=2, T=2, B=2
```

Can also specify row/column as Left/Right/Top/Bottom values to **Add** method

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Controlling the shape of the grid

- Can influence the determined shape and size of the columns and rows

```
Grid layout = new Grid();
layout.RowDefinitions.Add(new RowDefinition {
    Height = new GridLength(100, GridUnitType.Absolute) // 100px
});
layout.RowDefinitions.Add(new RowDefinition {
    Height = new GridLength(1, GridUnitType.Auto) // "Auto" size
});
layout.ColumnDefinitions.Add(new ColumnDefinition {
    Width = new GridLength(1, GridUnitType.Star)  // "Star" size
});
```

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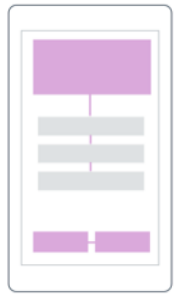
Working with RelativeLayout

- `RelativeLayout` allows you to position child views relative to two other views, or to the `RelativeLayout` itself using constraint-based rules



```
var layout = new RelativeLayout();
...
layout.Children.Add(label,
      Constraint.RelativeToParent(
            parent => (0.5 * parent.Width) - 25),    // X
     Constraint.RelativeToView(button,
            (parent, sibling) => sibling.Y + 5),     // Y
     Constraint.Constant(50),                        // Width
     Constraint.Constant(50));                       // Height
```

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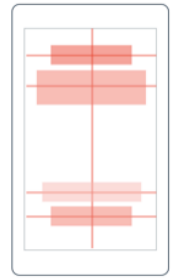
Working with AbsoluteLayout

- `AbsoluteLayout` positions and sizes children by **absolute values** through either a coordinate (where the view determines it's own size), or a bounding box



```
var layout = new AbsoluteLayout();
...
// Can do absolute positions by coordinate point
layout.Children.Add(label1, new Point(100, 100));

// Or use a specific bounding box
layout.Children.Add(label2, new Rectangle(20, 20, 100, 25));
```

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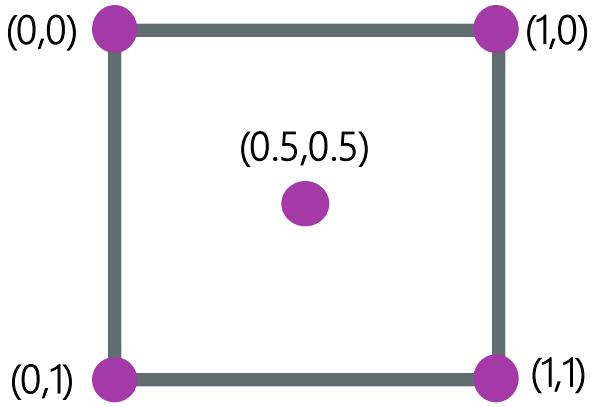
Working with AbsoluteLayout

- **`AbsoluteLayout`** can also position and size children **proportional to its own size** using coordinates based on a 1x1 unit square which represents a percentage of the container's size



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Working with AbsoluteLayout

- `AbsoluteLayout` can also position and size children **proportional to its own size** using coordinates based on a 1x1 unit square which represents a percentage of the container's size

```
var layout = new AbsoluteLayout();
...
// Center at the bottom of the container, take up ½ the space
layout.Children.Add(bottomLabel, new Rectangle (.5, 1, .5, .1),
                    AbsoluteLayoutFlags.All );
```

Here we center the label (.5) at the bottom of the container (1) and take up ½ the space (.5) width and 1/10 the space height (.1)

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Working with AbsoluteLayout

- **`AbsoluteLayout`** can also position and size children proportional to its own size using coordinates based on a 1x1 unit square which represents a percentage of the container's size

```
var layout = new AbsoluteLayout();
...
// Stretch image across entire container
layout.Children.Add(fillImage, new Rectangle (0, 0, 1, 1),
                    AbsoluteLayoutFlags.All );
```

Here we "fill" the container with an image
[0,0] – [1,1]

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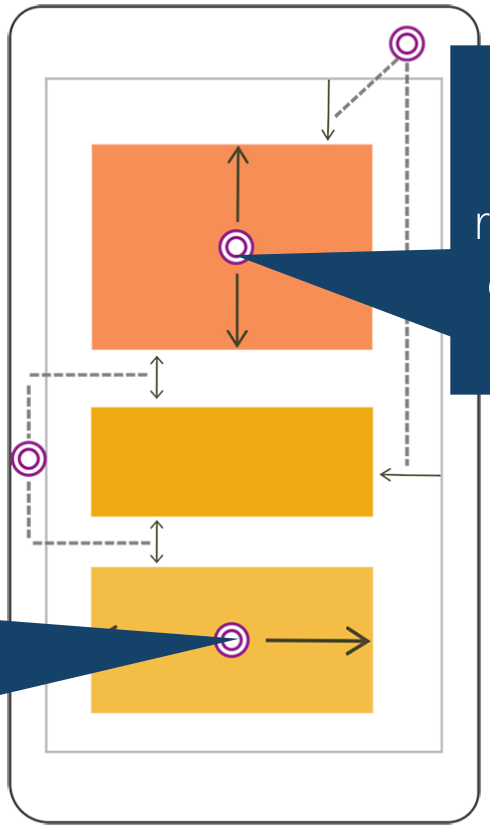
Fine-tuning AbsoluteLayout

- Can use either **Add** method, or specific static methods to control the bounding box and layout flags for children in **AbsoluteLayout** – this allows for "runtime" adjustments

```
Label bottomLabel;

void MoveLabelToTopRight(object sender, EventArgs e)
{
    AbsoluteLayout.SetLayoutBounds(bottomLabel,
                    new Rectangle (1, 0, .5, .1));
    AbsoluteLayout.SetLayoutFlags (bottomLabel,
                    AbsoluteLayoutFlags.All);
}
```

Adding spacing and padding

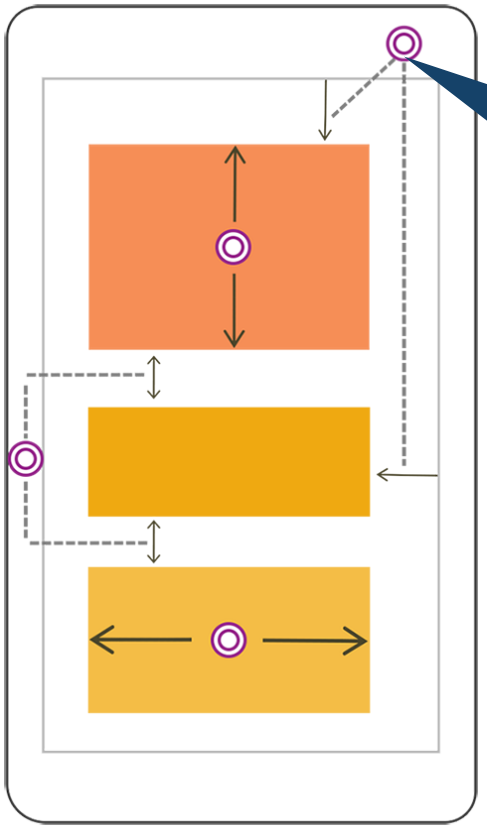


`HeightRequest` property used to request a specific height on a view in the parent container

`WidthRequest` property used to request a specific width on a view in the parent container

```
Button okButton = ...;
okButton.WidthRequest  = 100;
okButton.HeightRequest  = 75;
```

Adding spacing and padding



Padding property on parent containers is used to add padding *around* the children

```
ContentPage mainPage = ...;
mainPage.Padding =
    new Thickness(5,20,5,5);
```

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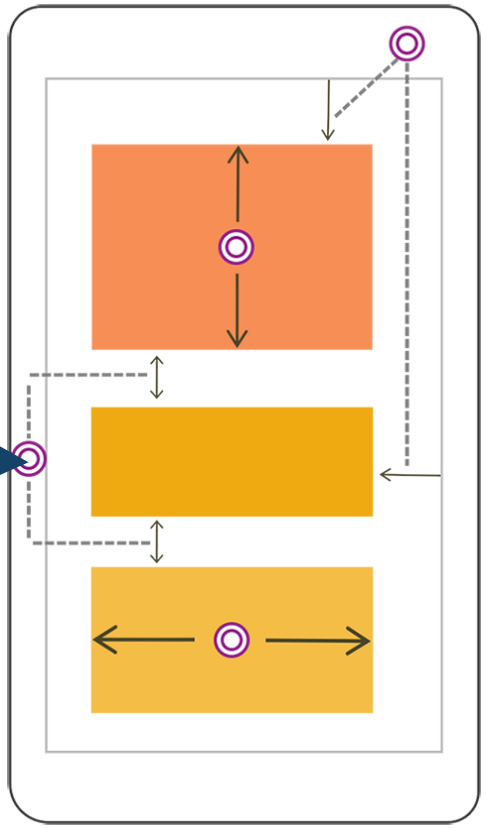
Adding spacing and padding

`Spacing` property on **`StackLayout`** and **`Grid`** allows you to control spacing *in-between* children



```
StackLayout layout = ...;
layout.Spacing = 20;
```

```
Grid layout = ...;
layout.RowSpacing = 10;
layout.ColumnSpacing = 20;
```

Individual Exercise

Creating Xamarin.Forms Phoneword

Flash Quiz

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Flash Quiz

① The direction (left-to-right or top-to-bottom) a `StackLayout` organizes content is controlled by which property?

a) Style
b) Direction
c) Orientation
d) LayoutDirection

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Flash Quiz

① The direction (left-to-right or top-to-bottom) a `StackLayout` organizes content is controlled by which property?

a) Style
b) Direction
c) Orientation
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Flash Quiz

② Which of these controls is not available in Xamarin.Forms?

a) Button
b) DatePicker
c) ListBox
d) ListView

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Flash Quiz

② Which of these controls is not available in Xamarin.Forms?

a) Button
b) DatePicker
c) ListBox
d) ListView

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Flash Quiz

③ To adjust spacing between children when using the `StackLayout` container we can change the _____ property.

a) Margin

b) Padding

c) Spacing

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Flash Quiz

③ To adjust spacing between children when using the `StackLayout` container we can change the _____ property.

a) Margin

b) Padding

c) Spacing

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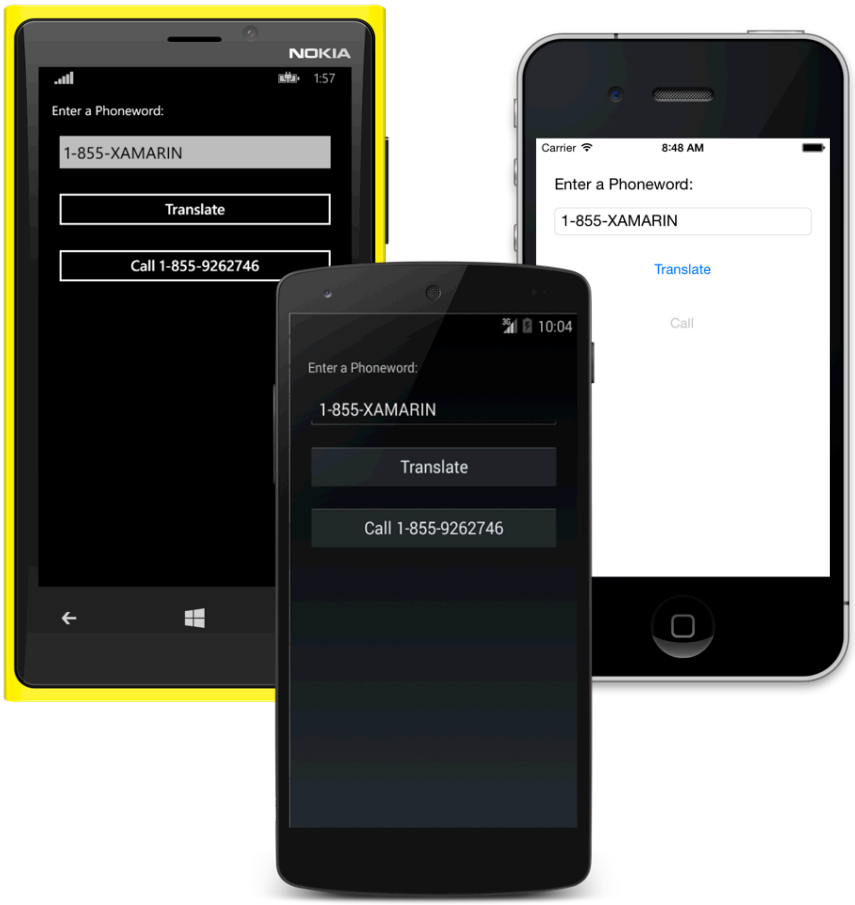
Summary

- Layout containers
- Adding views
- Fine-tuning layout



Using Platform-Specific Features

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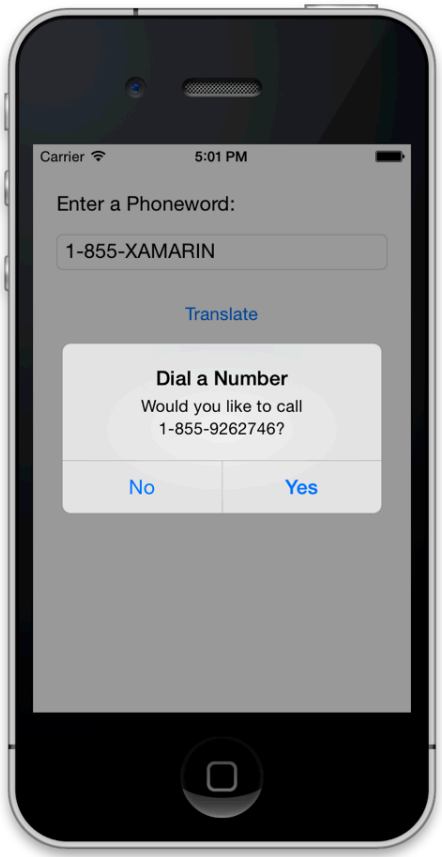
Tasks

- Changing the UI per-platform
- Using Platform features
- Working with `DependencyService`



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Recall: Xamarin.Forms architecture

- Xamarin.Forms applications have two projects that work together to provide the logic + UI for each executable

- *shared* across all platforms
- limited access to .NET APIs
- want most of our code here

- 1-per platform
- code is *not* shared
- full access to .NET APIs
- any platform-specific code must be located in these projects

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Changing the UI per-platform

- `Device.OnPlatform` allows you to fine-tune the UI for each platform

```
Device.OnPlatform(
    iOS: () => { ... },
    Android: () => { ... },
    WinPhone: () => { ... },
    Default: () => { ... });
```

Can execute specific logic per-platform using delegates for each platform

```
new Thickness(5,
    Device.OnPlatform(20, 0, 0),
    5, 5);
```

Can return a different value per-platform (iOS, Android, WinPhone) using `Device.OnPlatform<T>`

This code is used in the shared code but only uses one of the supplied values or delegates when the code is executed on a specific platform

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Detecting the platform

- Can use the static **`Device`** class to identify the platform and device style

```
if (Device.Idiom == TargetIdiom.Tablet) {
    // Code for tablets only
    if (Device.OS == TargetPlatform.iOS) {
        // Code for iPad only
    }
}
```

Note that this does not allow for *platform-specific code* to be executed, it allows runtime detection of the platform to execute a unique branch of code in your shared PCL

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Using Platform Features

- Xamarin.Forms has support for dealing with a few, very common platform-specific features

`Device.OpenUri`
to launch external apps based on a URL scheme

`Page.DisplayAlert`
to show simple alert messages

Timer management using `Device.StartTimer`

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Using Platform Features

- Xamarin.Forms has support for dealing with a few, very common platform-specific features

UI Thread marshaling with Device.BeginInvoke OnMainThread

Mapping and Location through `Xamarin.Forms.Maps`

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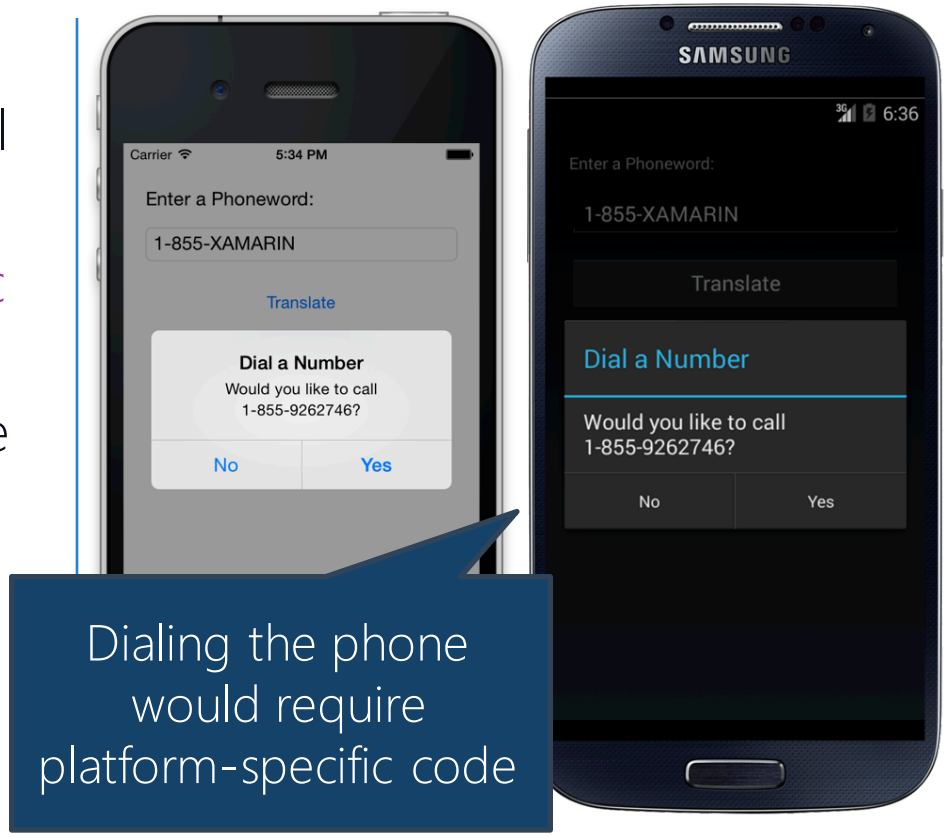
Other platform-specific features

- Platform features *not* exposed by Xamarin.Forms can be used, but will require some architectural design
  - code goes into platform-specific projects
  - often must (somehow) use code from your shared logic project
- Attend **XAM110** and **XAM300** for more details



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Creating abstractions

- Best practice to build an *abstraction* implemented by the target platform which defines the platform-specific functionality

```
public interface IDialer
{
    bool MakeCall(string number);
}
```

Shared code defines **IDialer** interface to represent required functionality

PhoneDialerIOS

PhoneDialerDroid

PhoneDialerWin

Platform projects implement the shared dialer interface using the platform-specific APIs

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Locating dependencies

- Xamarin.Forms includes a *service locator* called **`DependencyService`** which can be used to register platform-specific implementations and then locate them through the abstraction in your shared code

1. Define an interface or abstract class in the shared code project (PCL)

```
public interface IDialer
{
    bool MakeCall(string number);
}
```

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Locating dependencies

- Xamarin.Forms includes a *service locator* called **`DependencyService`** which can be used to register platform-specific implementations and then locate them through the abstraction in your shared code

2 Provide implementation of abstraction in each platform-specific project

```
class PhoneDialerIOS : IDialer
{
    public bool MakeCall(string number) {
      // Implementation goes here
    }
}
```

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Locating dependencies

- Xamarin.Forms includes a *service locator* called **`DependencyService`** which can be used to register platform-specific implementations and then locate them through the abstraction in your shared code

3 Expose platform-specific implementation using assembly-level attribute in platform-specific project

```
[assembly: Dependency(typeof(PhoneDialerIOS))]
```

Implementation type is supplied to attribute as part of registration

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Locating dependencies

- Xamarin.Forms includes a *service locator* called **`DependencyService`** which can be used to register platform-specific implementations and then locate them through the abstraction in your shared code

4 Retrieve and use the dependency anywhere using **`DependencyService.Get<T>`** (both shared and platform specific projects can use this API)

```
IDialer dialer = DependencyService.Get<IDialer>();
if (dialer != null) {
    ...
}
```

Request the *abstraction* and the implementation will be returned

Individual Exercise

Adding support for dialing the phone

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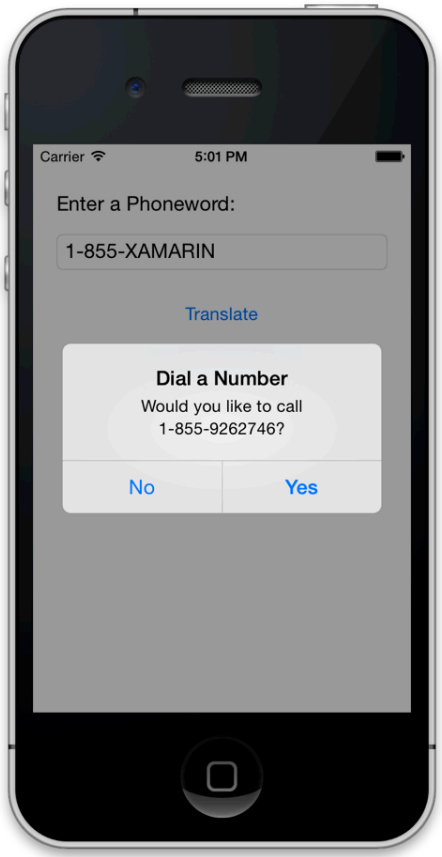
Summary

- Changing the UI per-platform
- Using Platform features
- Working with `DependencyService`



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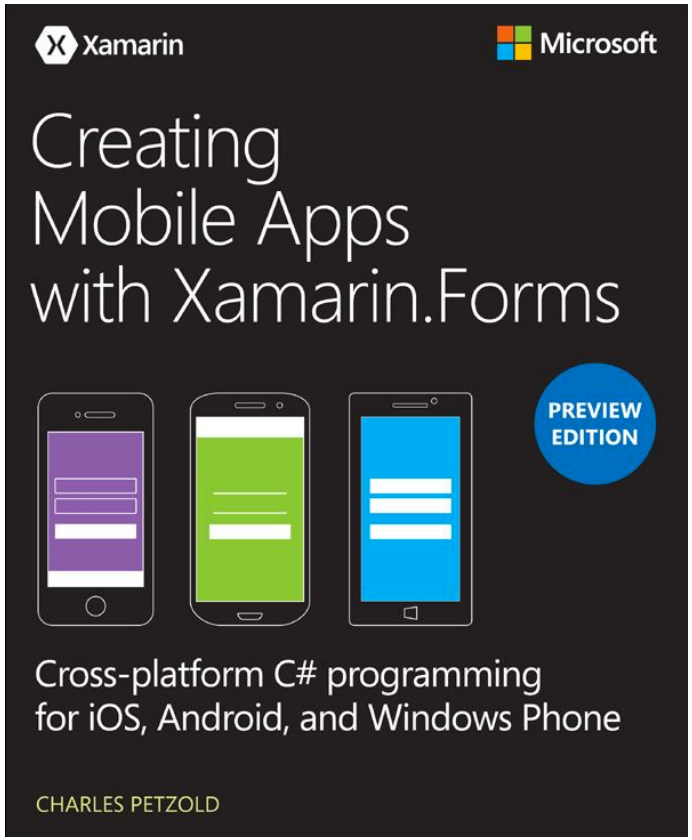
What's Next?

- ✓ **XAM130** continues your exploration of Xamarin.Forms by diving into XAML
- ✓ **XAM140** looks at Styles and Triggers
- ✓ **XAM310** covers Data Binding
- ✓ **XAM311/312** explores the **`ListView`**
- ✓ **XAM320** caps it off with MVVM coverage

Also, make sure to download Charles Petzold's book online: bit.ly/xforms-book



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