

HOL02 – HOL Xamarin Xamarin.Forms

Roy Cornelissen &
Marcel de Vries



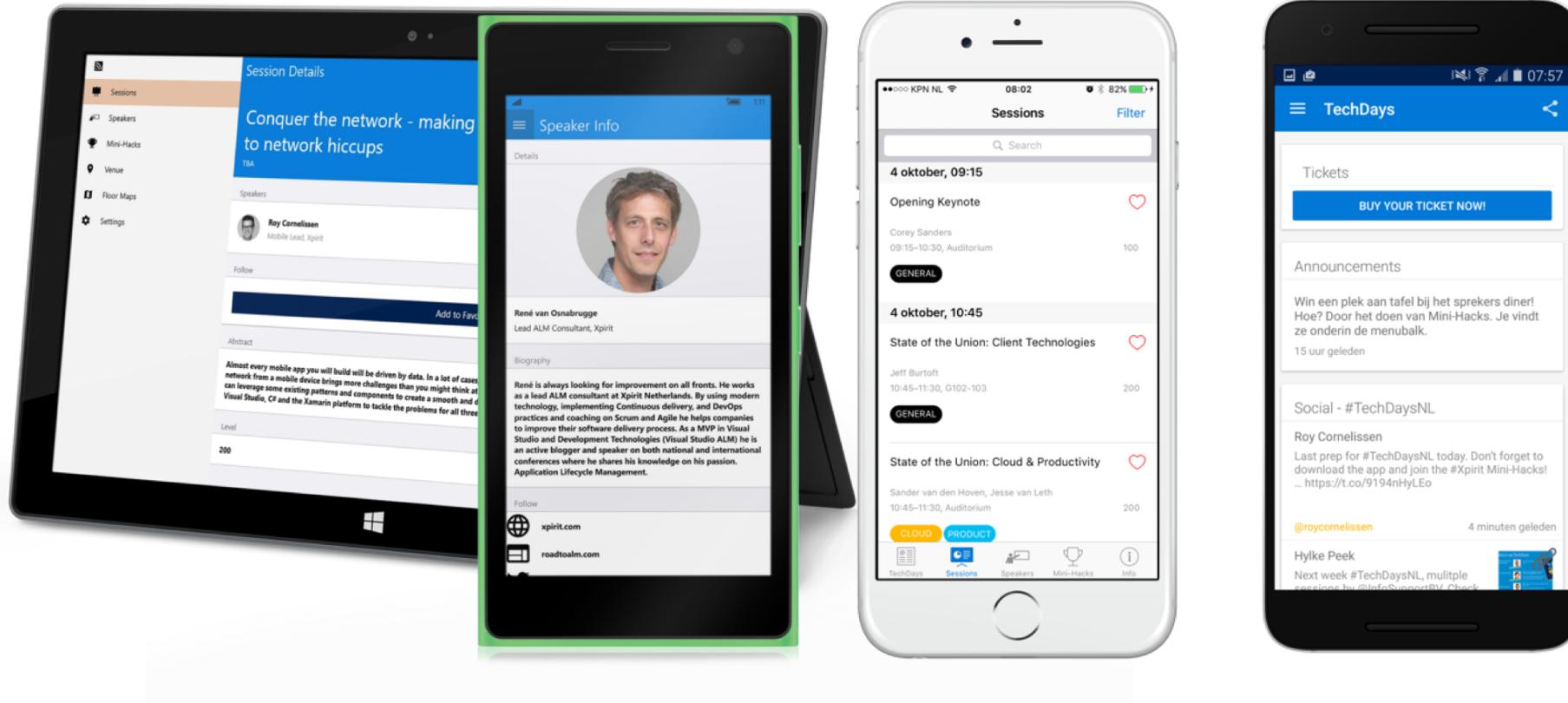
Level: Introductory - Intermediate



Respect the Past,
Code the Future.

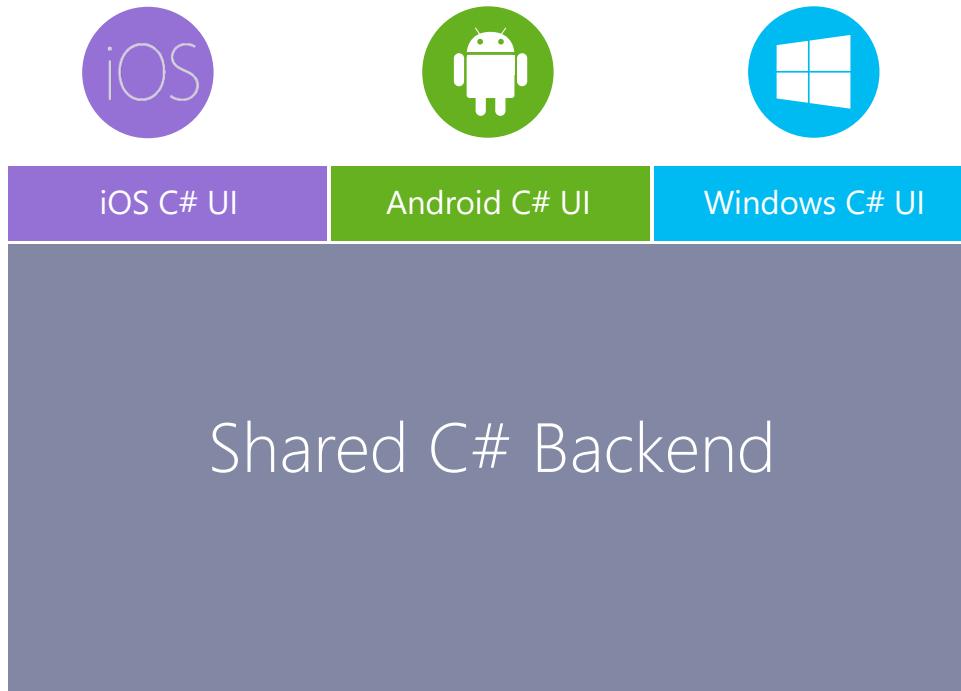


Meet Xamarin.Forms

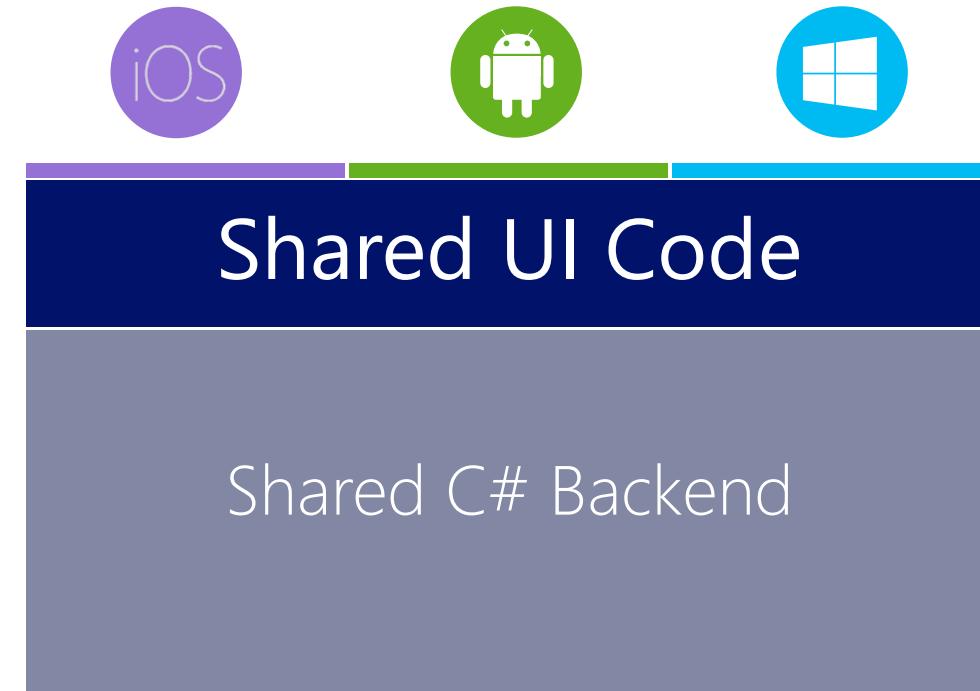


Build native UIs for iOS, Android, and Windows
from a single, shared C# codebase.

Xamarin + Xamarin.Forms

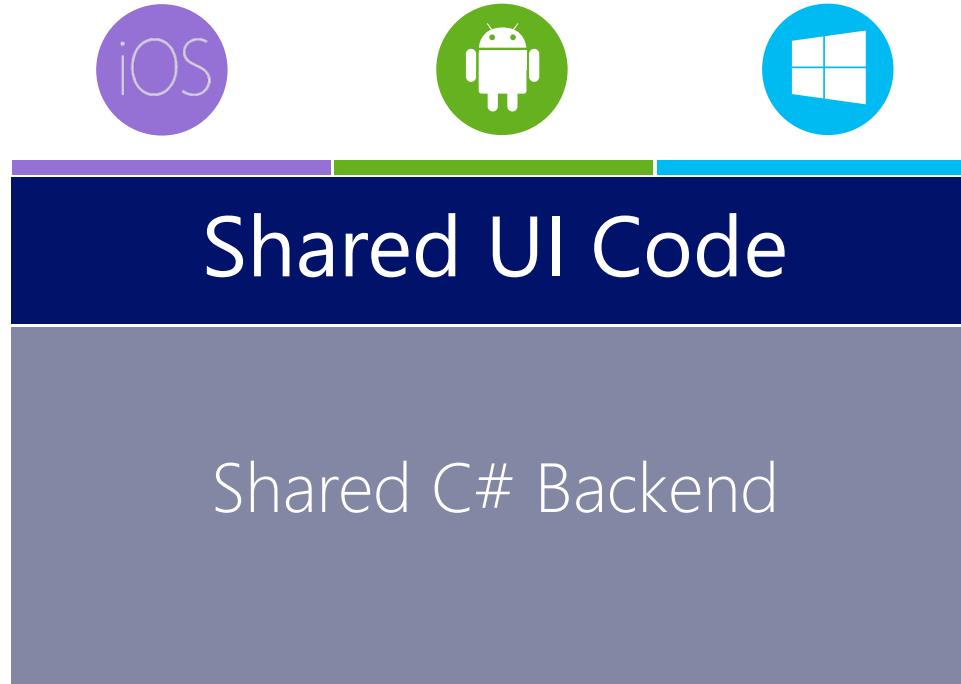


Traditional Xamarin
Approach



With Xamarin.Forms:
More code-sharing, all native

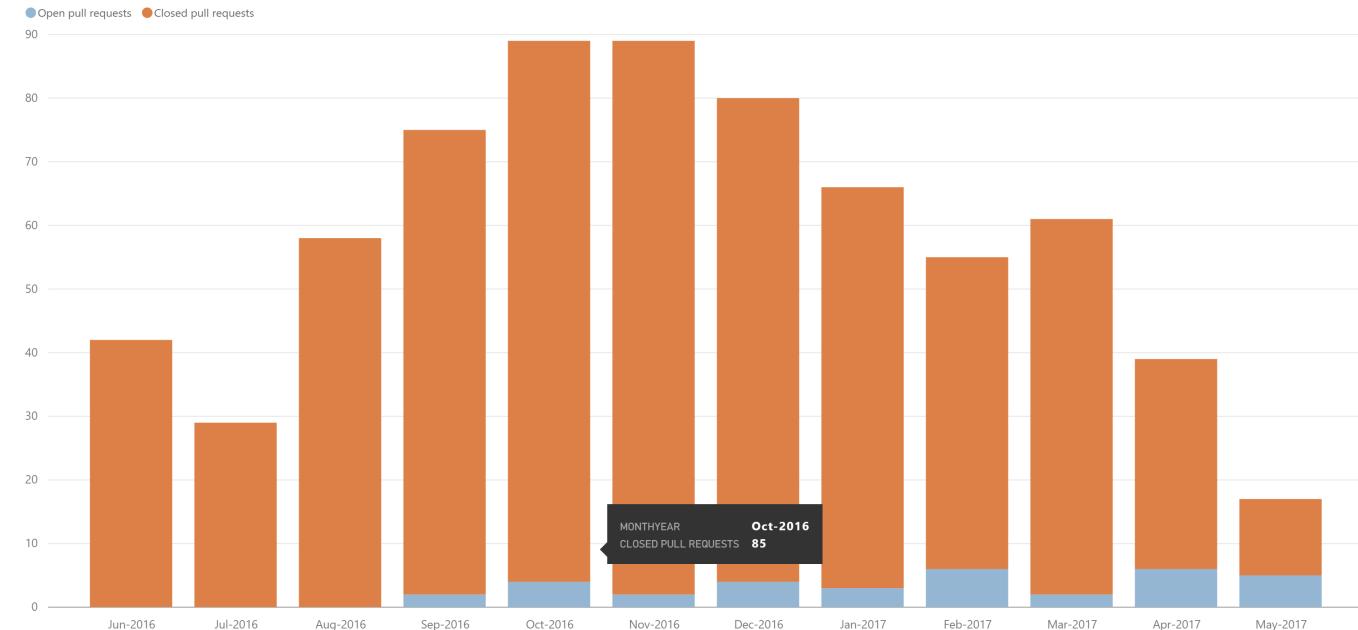
What's included



- ✓ 40+ Pages, layouts, and controls
(Build from code behind or XAML)
- ✓ Two-way data binding
- ✓ Navigation
- ✓ Animation API
- ✓ Dependency Service
- ✓ Messaging Center

Community

- Public Roadmap: aka.ms/xfroadmap
- 70 contributors
- 700 merged pull requests
- 37 evolution proposals



Features and Enhancements by Community

Native Control Binding

Startup Time

Frame Corners

macOS Preview

Deep Linking

Styles

Xamarin.Forms Embedding

Partial Collapse MasterPage

Memory Improvements

XAMLC

Forms Previewer

FlexLayout Preview

Tizen

Themes

ListView Scrolling

.netstandard support

Accessibility

Fast Renderers Preview

Bindable Picker

Map Extensibility

Android Support Libraries

Enhanced GestureRecognizers

Blur Behind

Embedded Native Controls

Fast Scroll

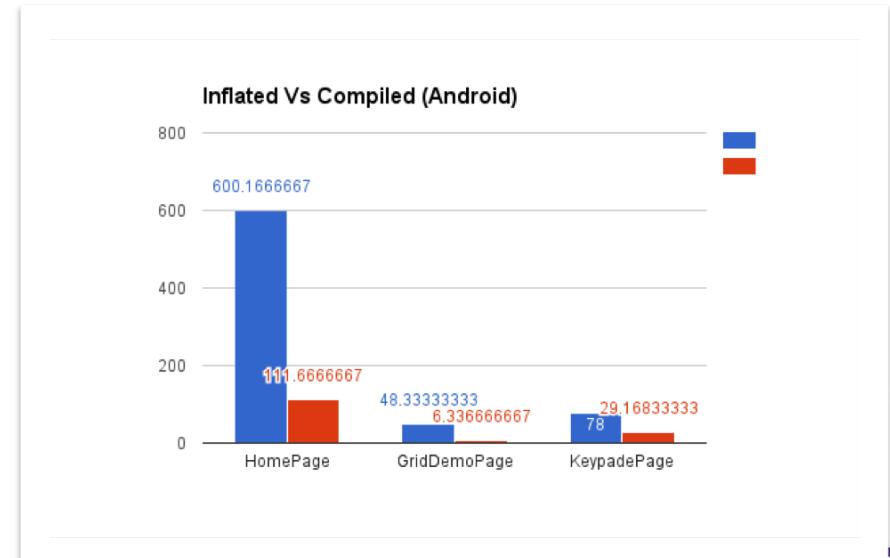
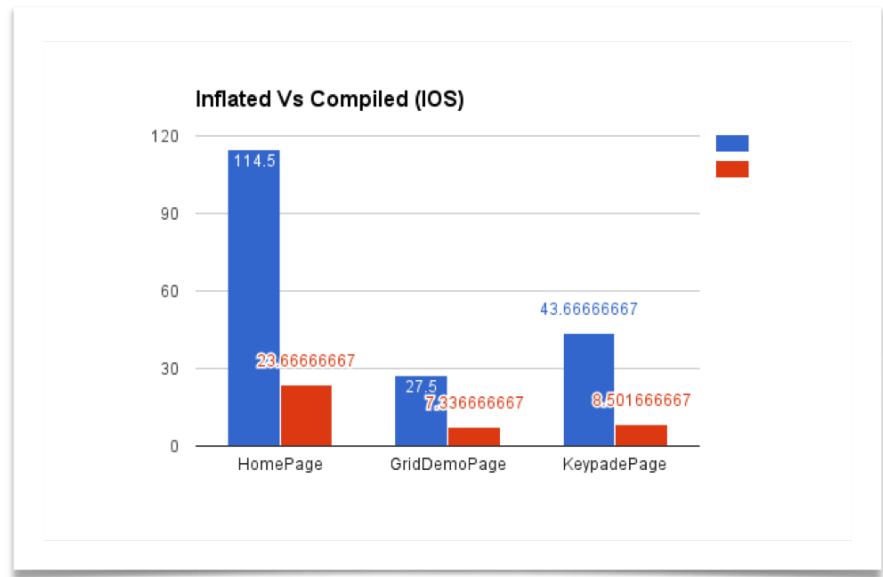
NavigationPage Translucency

PlatformSpecifics

DataPages

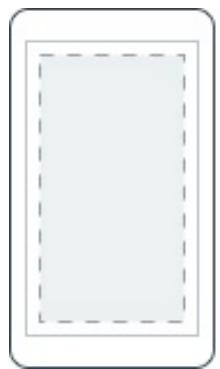
Quality and Performance

- Aggressive bug triage
 - New issues reviewed within 24 hrs
 - Reproduction projects for quick resolution
- Performance Improvements
 - Startup Time
 - Fast Renderers for Android
 - ListView improvements, Fast Scroll
 - XAMLC – 5x faster
 - Discussion: aka.ms/xfperformance

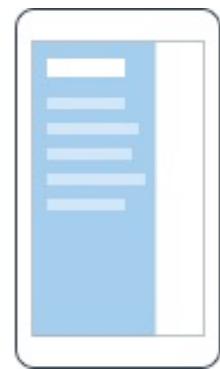


Source: Matthew Robbins -
MFractor

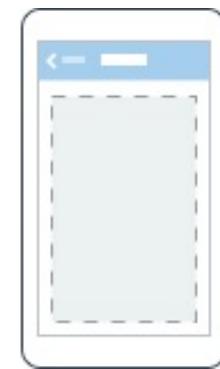
Pages



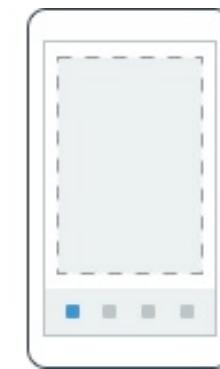
Content



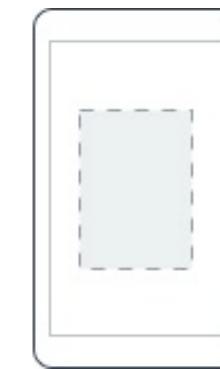
MasterDetail



Navigation

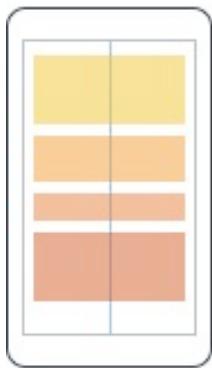


Tabbed

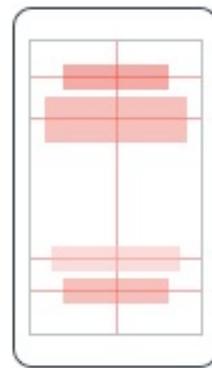


Carousel

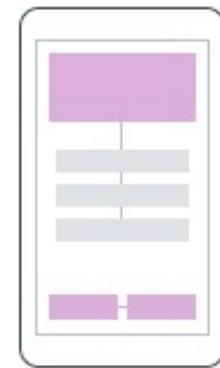
Layouts



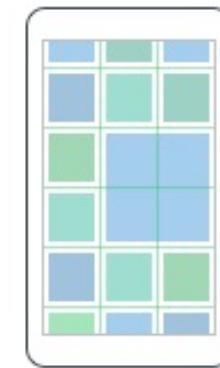
Stack



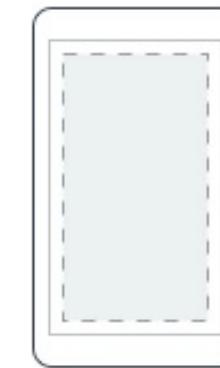
Absolute



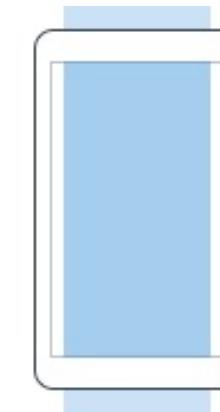
Relative



Grid



ContentView



ScrollView



Frame

Controls

ActivityIndicator

BoxView

Button

DatePicker

Editor

Entry

Image

Label

ListView

Map

OpenGLView

Picker

ProgressBar

SearchBar

Slider

Stepper

TableView

TimePicker

WebView

EntryCell

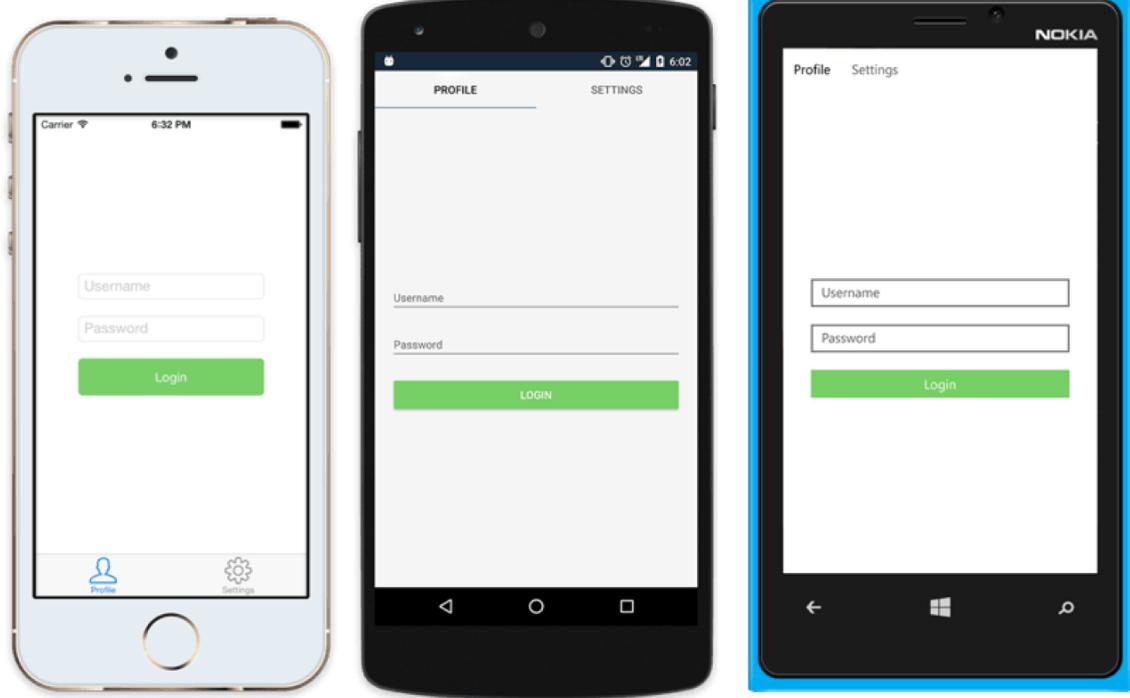
ImageCell

SwitchCell

TextCell

ViewCell

Native UI from shared code



```
<?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="MyApp.MainPage">
<TabbedPage.Children>
<ContentPage Title="Profile" Icon="Profile.png">
    <StackLayout Spacing="20" Padding="20"
                 VerticalOptions="Center">
        <Entry Placeholder="Username"
              Text="{Binding Username}"/>
        <Entry Placeholder="Password"
              Text="{Binding Password}"
              IsPassword="true"/>
        <Button Text="Login" TextColor="White"
               BackgroundColor="#77D065"
               Command="{Binding LoginCommand}"/>
    </StackLayout>
</ContentPage>
<ContentPage Title="Settings" Icon="Settings.png">
    <!-- Settings -->
</ContentPage>
</TabbedPage.Children>
</TabbedPage>
```

Xamarin.Forms Ecosystem



Control Comparison

Windows	Xamarin.Forms
StackPanel	StackLayout
TextBox	Entry
ListBox	ListView
CheckBox	Switch
ProgressBar	ActivityIndicator
Grid	Grid
Label	Label
Button	Button
Image	Image
Date/TimePicker	Date/TimePicker

Windows	Xamarin.Forms
DataContext	BindingContext
{Binding Property}	{Binding Property}
ItemsSource	ItemsSource
ItemTemplate	ItemTemplate
DataTemplate	DataTemplate

```
<Label Text="{Binding Color.R,
    Converter={StaticResource intConverter},
    ConverterParameter=255,
    StringFormat='R={0:X2}' }" />
```

Binding Comparison

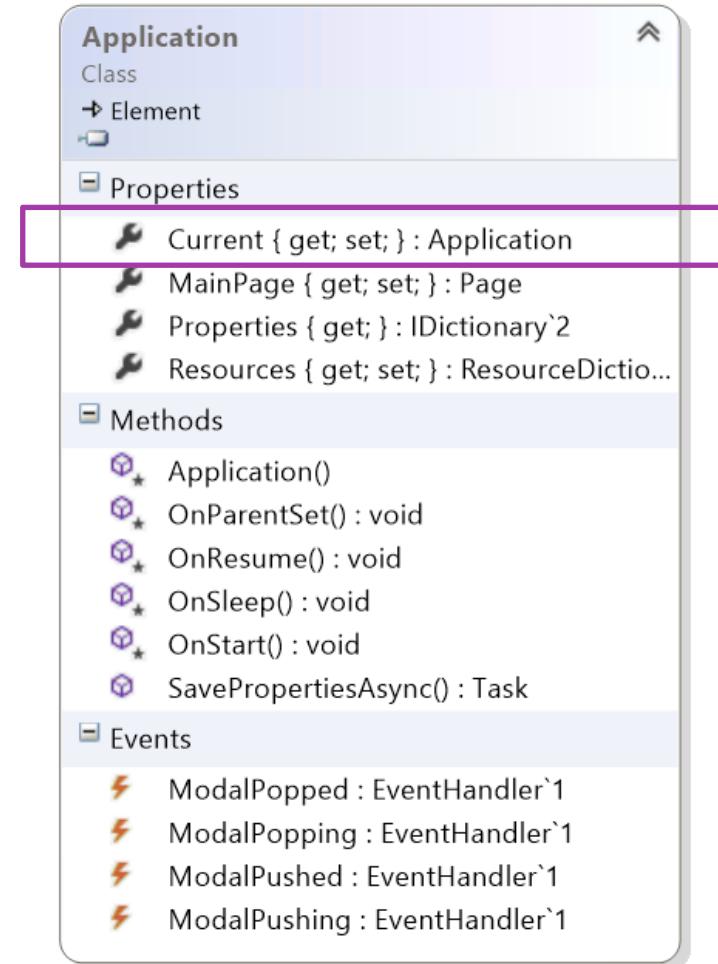
Xamarin.Forms app anatomy

- ❖ 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!



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

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

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

Persisting information

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

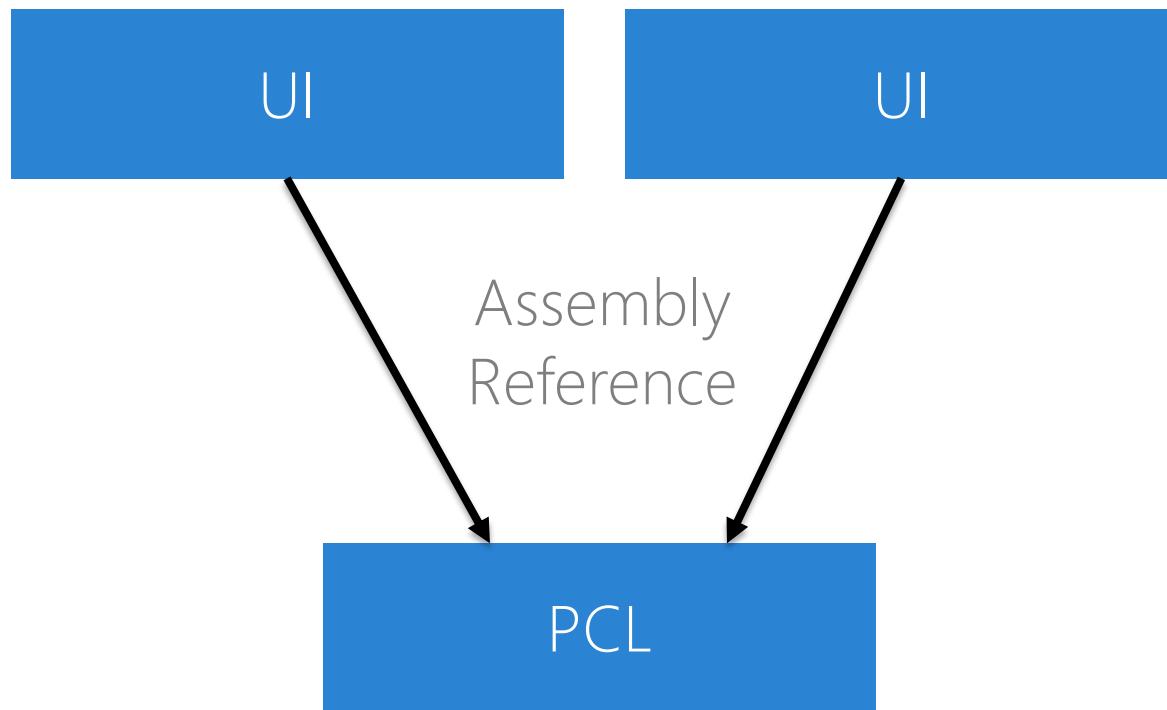
```
// Save off username in global property bag
Application.Current.Properties["username"] = username.Text;
```

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

Demo

- ❖ First Xamarin Forms Application

Portable Class Library



Runtime concept

Lowest common denominator
across target profiles

Binary reuse

Portable Class Libraries

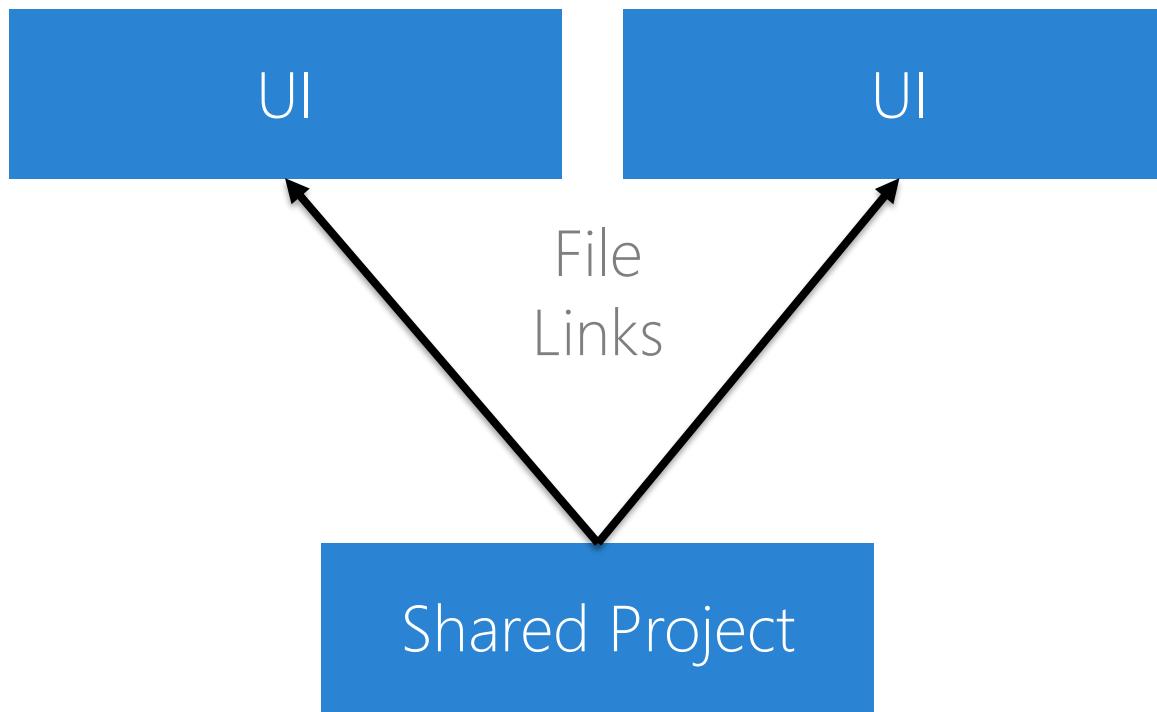
Pros

- One class library project
- Use well-known references
- Reuse DLL across platforms

Cons

- Lowest common denominator
- Can't use compiler directives
- Platform-specific code complex

Shared Project



Compile time concept

Files are compiled
into target platform
binary

Shared Project

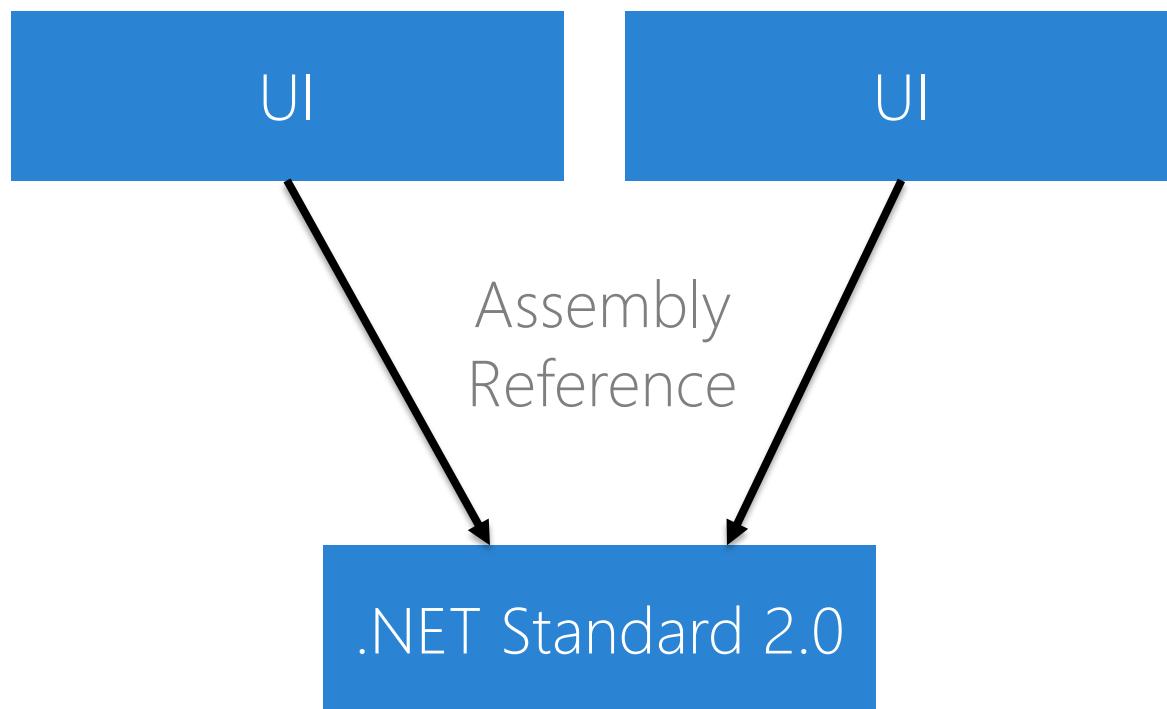
Pros

- One code library project
- Code is reused
- Can use compiler directives
- Platform-specific code easy

Cons

- No assembly to reuse
- Uses less known file linking
- Testing potentially harder

.NET Standard 2.0 Library



Runtime concept

Full access to .NET API's

Binary reuse

.NET Standard 2.0 Library

Pros

- One class library project
- Use well-known references
- Reuse DLL across platforms
- Multi-targeting option (best of both worlds)

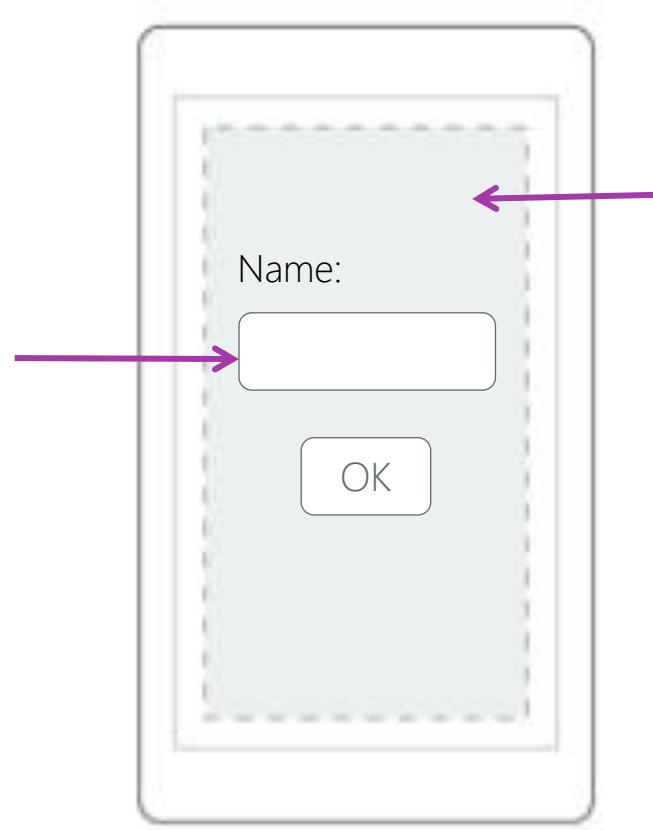
Cons

- Not fully supported by Visual Studio for Mac yet
- Some Nuget packages don't support .NET Standard yet

Creating the application UI

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

Views are the UI controls the user interacts with



Page represents a single screen displayed in the app

Pages

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

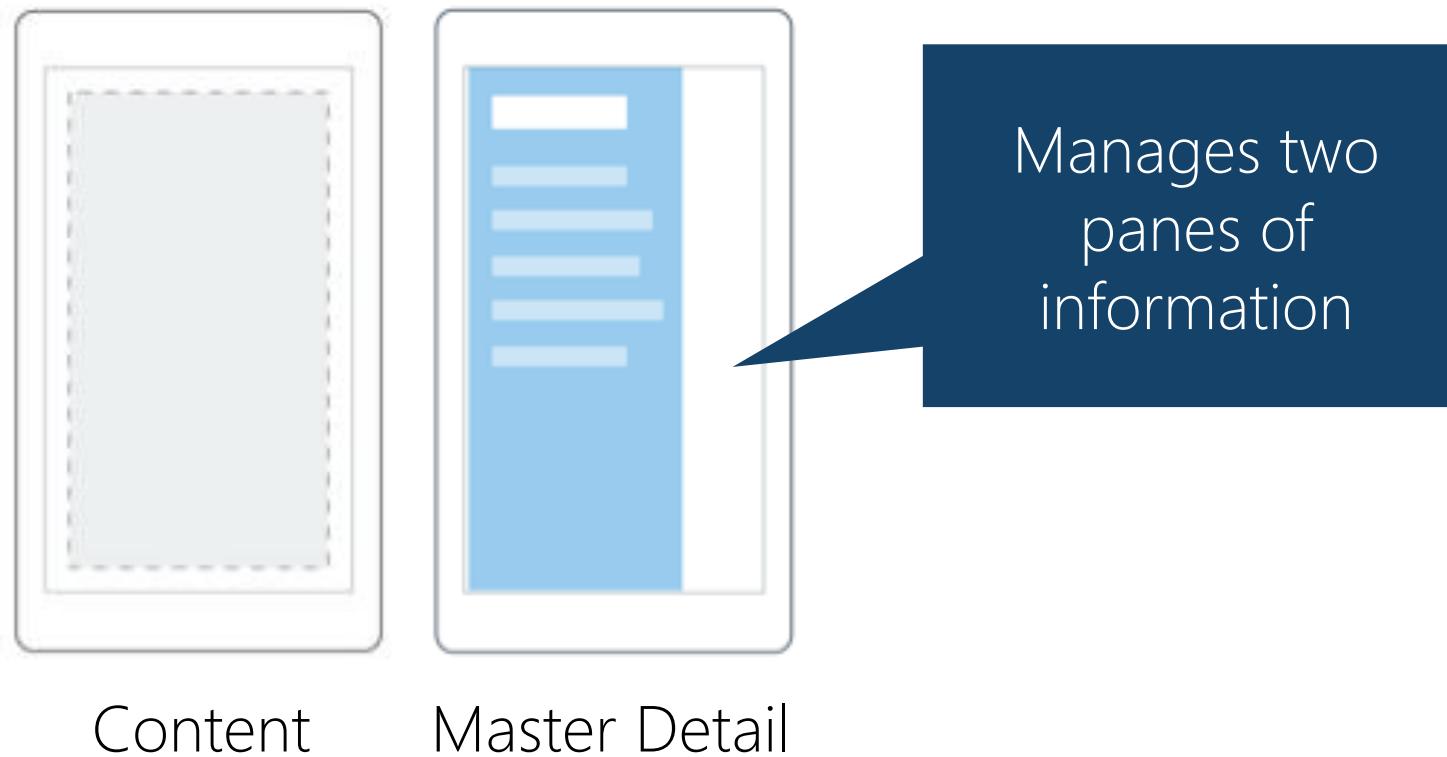


Content

Displays a single
piece of *content*
(visual thing)

Pages

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



Pages

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



Content



Master Detail

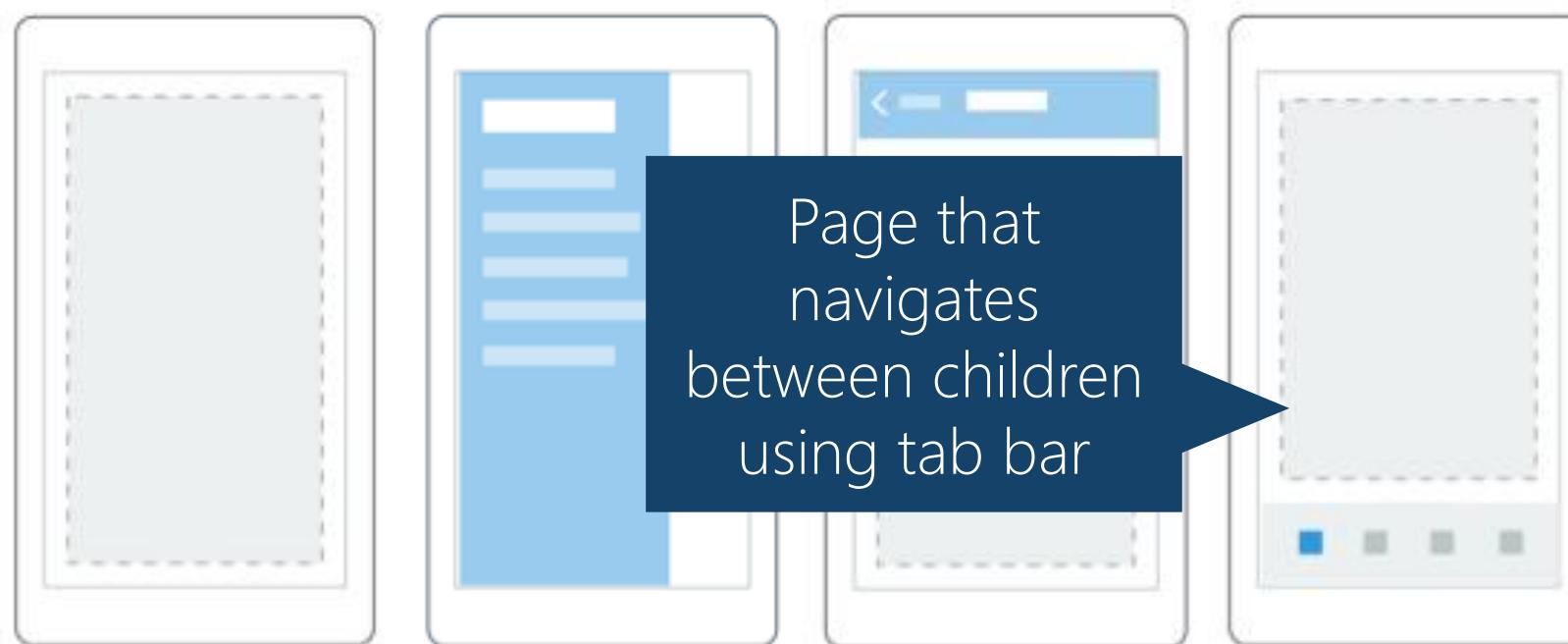


Navigation

Manages a *stack* of pages with navigation bar

Pages

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



Content

Master Detail

Navigation

Tabbed

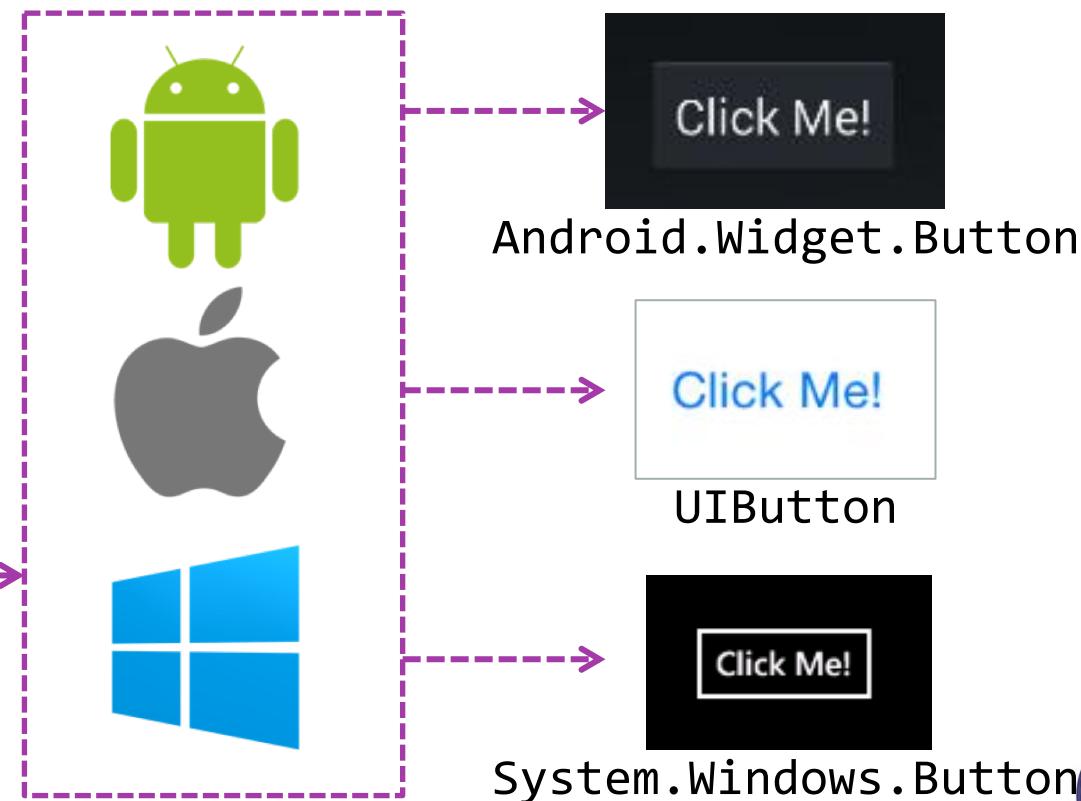
Rendering views

- ❖ 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

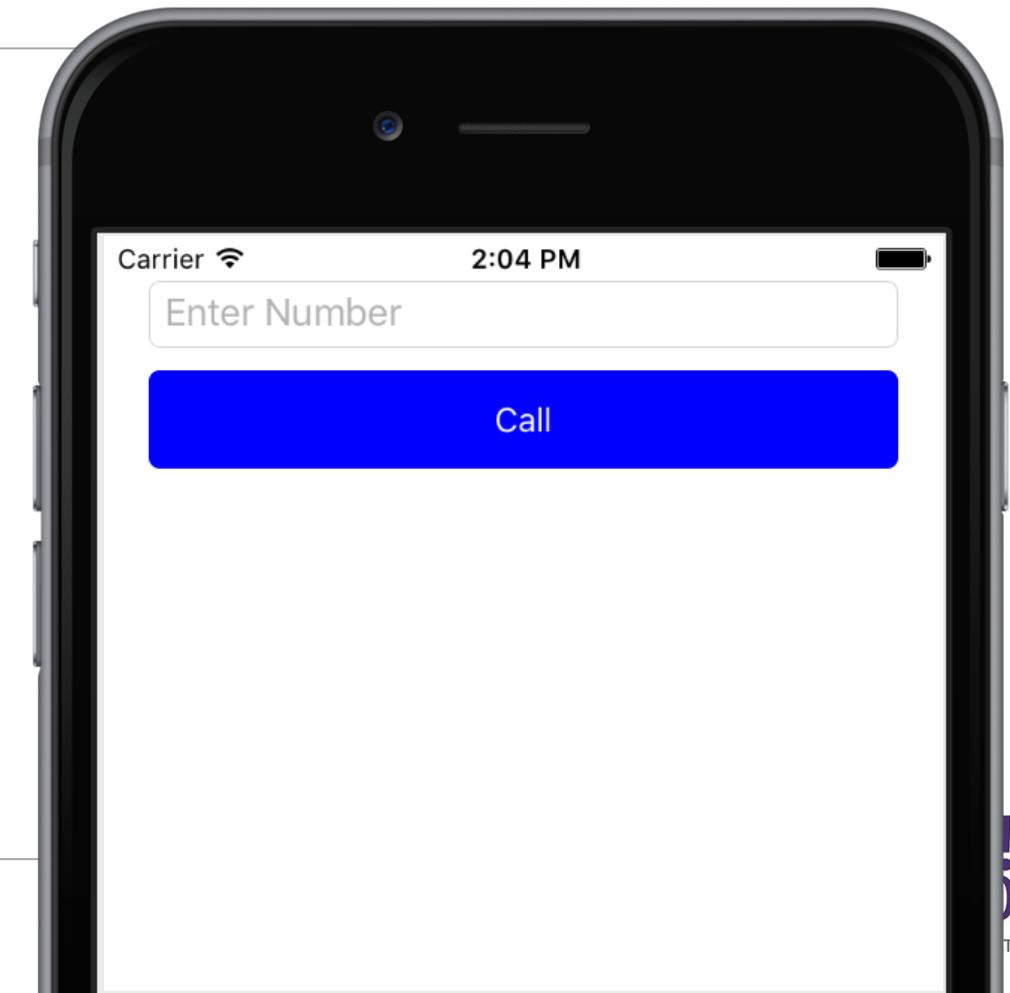


Visual adjustments

- ❖ 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  
};
```



Providing Behavior

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

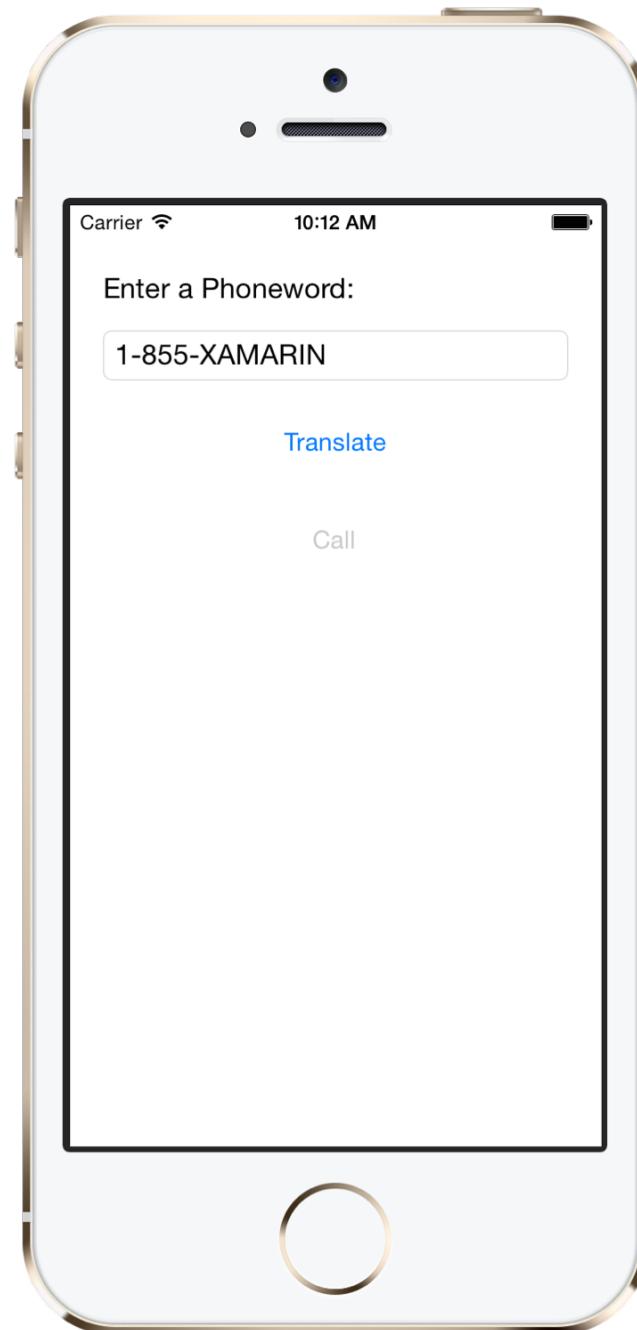
```
Entry numEntry = new Entry { ... };
numEntry.TextChanged += OnTextChanged;
...
void OnTextChanged (object sender, string newValue)
{
    ...
}
```



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

XAML

- ❖ Our goal is to build the UI for this screen
 - Label (Enter a Phoneword:)
 - Entry (1-855-XAMARIN)
 - Button (Translate)
 - Button (Call)



Describing a screen in XAML

- ❖ XAML is used to construct object graphs, in this case a visual **Page**

```
<?xml version="1.0" encoding="UTF-8" ?>
<ContentPage ...>
    <StackLayout Padding="20" Spacing="10">
        <Label Text="Enter a Phoneword:" />
        <Entry Placeholder="Number" />
        <Button Text="Translate" />
        <Button Text="Call" IsEnabled="False" />
    </StackLayout>
</ContentPage>
```

XML based: case sensitive, open tags must be closed, etc.

Describing a screen in XAML

- ❖ XAML is used to construct object graphs, in this case a visual **Page**

Element tags
create objects

```
<?xml version="1.0" encoding="UTF-8" ?>
<ContentPage ...>
    <StackLayout Padding="20" Spacing="10">
        <Label Text="Enter a Phoneword:" />
        <Entry Placeholder="Number" />
        <Button Text="Translate" />
        <Button Text="Call" IsEnabled="False" />
    </StackLayout>
</ContentPage>
```

Describing a screen in XAML

- ❖ XAML is used to construct object graphs, in this case a visual **Page**

```
<?xml version="1.0" encoding="UTF-8" ?>
<ContentPage ...>
    <StackLayout Padding="20" Spacing="10"> ←
        <Label Text="Enter a Phoneword:" />
        <Entry Placeholder="Number" />
        <Button Text="Translate" />
        <Button Text="Call" IsEnabled="False" />
    </StackLayout>
</ContentPage>
```

Attributes set
properties or
events

Describing a screen in XAML

- ❖ XAML is used to construct object graphs, in this case a visual **Page**

Child nodes
used to
establish
relationship

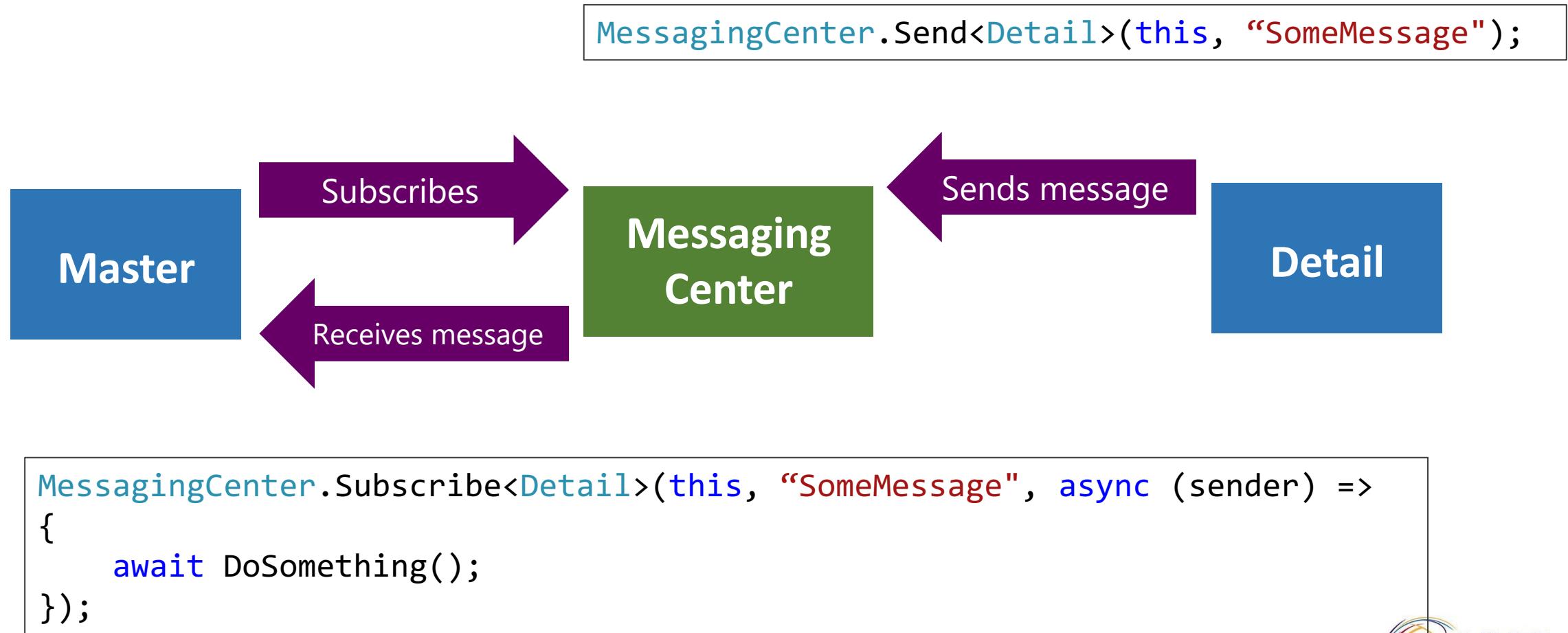
```
<?xml version="1.0" encoding="UTF-8" ?>
<ContentPage ...>
    <StackLayout Padding="20" Spacing="10">
        <Label Text="Enter a Phoneword:" />
        <Entry Placeholder="Number" />
        <Button Text="Translate" />
        <Button Text="Call" IsEnabled="False" />
    </StackLayout>
</ContentPage>
```

My first Xamarin.Forms app

Lab – app-quotes

Lab02 – exercises 1-3

Messaging center



Animations

- Cross-platform animations
- Translates to native animations as much as possible
- Async / Await API

```
ProfileImage.FadeTo (1, 1000);  
ProfileImage.RotateTo (360, 1000, Easing.CubicOut);  
ProfileImage.to
```

- X LayoutTo
- X RelRotateTo
- X RelScaleTo
- X RotateTo
- X RotateXTo
- X RotateYTo
- X ScaleTo

Platform tweaks

Use Device class in shared code

Xamarin.Forms.Device

- Device.Styles
Styles for controls, e.g. labels & lists
- Device.GetNamedSize
Font sizes
- Device.Idiom
Tablet or phone specific code / behavior
- Device.OS
Target platform specific code
- Device.OnPlatform()
Target platform specific values
- Device.OpenUri()
- Device.StartTimer()
- Device.BeginInvokeOnMainThread()

XAML resources

- By default, your XAML files are included as a plain-text resource in the generated assembly which is parsed at runtime to generate the page

```
private void InitializeComponent()
{
    this.LoadFromXaml(typeof(MainPage));
}
```



This **Page** method looks up the embedded resource by name, parses it, and creates each object found; it returns the root created object

Compiling XAML

- ❖ XAML can be optionally compiled to intermediate language (IL)
 - Provides compile-time validation of your XAML files
 - Reduces the load time for pages
 - Reduces the assembly size by removing text-based **.xaml** files



Enabling XAMLC

- XAMLC (the XAML compiler) is disabled by default to ensure backwards compatibility; can be enabled through a .NET attribute

```
using Xamarin.Forms.Xaml;  
  
[assembly: XamlCompilationAttribute(  
    XamlCompilationOptions.Compile)]
```



Can enable the compiler for all XAML files in the assembly

Enabling XAMLC

- XAMLC (the XAML compiler) is disabled by default to ensure backwards compatibility; can be enabled through a .NET attribute

```
using Xamarin.Forms.Xaml;  
  
[XamlCompilationAttribute(XamlCompilationOptions.Compile)]  
public partial class MainPage : ContentPage {
```



... or on a specific XAML-based class

What does it do?

- Attribute presence causes MSBuild command to be run which parses the XAML and generates **InitializeComponent** to create the page in code

```
private void InitializeComponent()
{
    Label label = new Label();
    StackLayout stackLayout = new StackLayout();
    stackLayout.SetValue(VisualElement.BackgroundColorProperty,
        new ColorTypeConverter().ConvertFrom("Red"));
    stackLayout.SetValue(Layout.PaddingProperty,
        new ThicknessTypeConverter().ConvertFrom("10"));
    stackLayout.SetValue(StackLayout.SpacingProperty, 5);
    label.SetValue(Label.TextProperty, "Hello, Forms");
    stackLayout.Children.Add(label);
    ...
    this.Content = stackLayout;
}
```

Disabling XAMLC

- Attribute also lets you disable XAMLC for a specific class

```
using Xamarin.Forms.Xaml;  
  
[XamlCompilationAttribute(XamlCompilationOptions.Skip)]  
public partial class DetailsPage : ContentPage {
```



Specify `Skip` to turn off compiler for this specific page; goes back to using `LoadFromXaml`

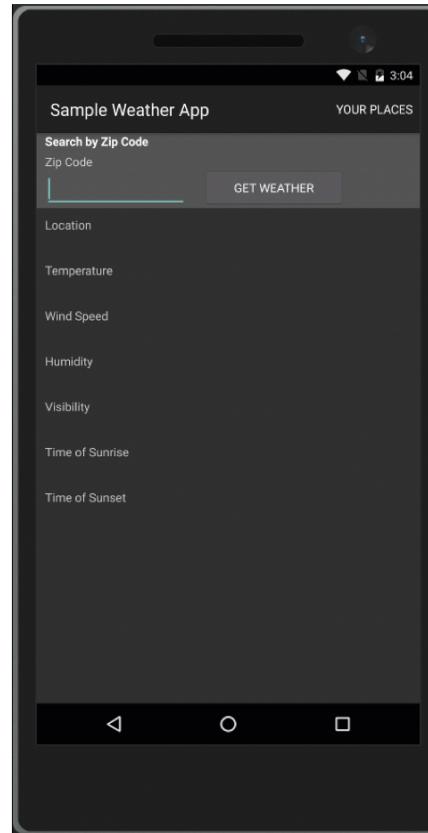
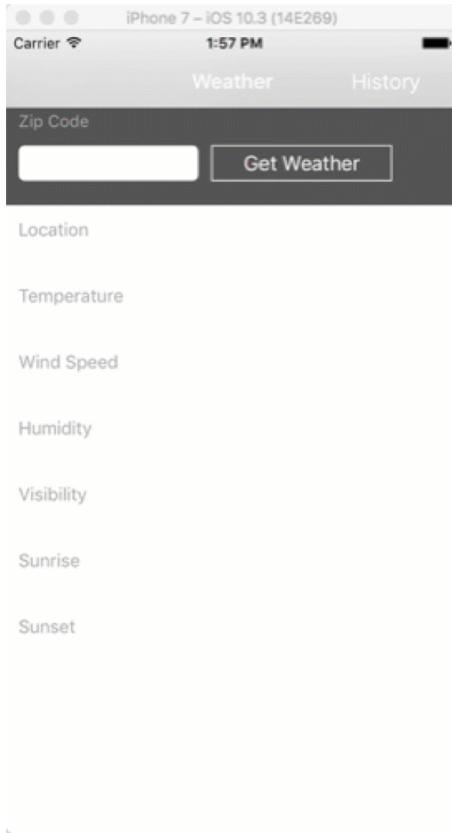
XAML Standard 1.0

- Attempt to standardize all XAML variations
 - UWP, Forms, WPF, ...
- Open source project
 - <https://github.com/Microsoft/xaml-standard>

The Future:
Xamarin.Forms 3.0

Xamarin.Forms Embedding

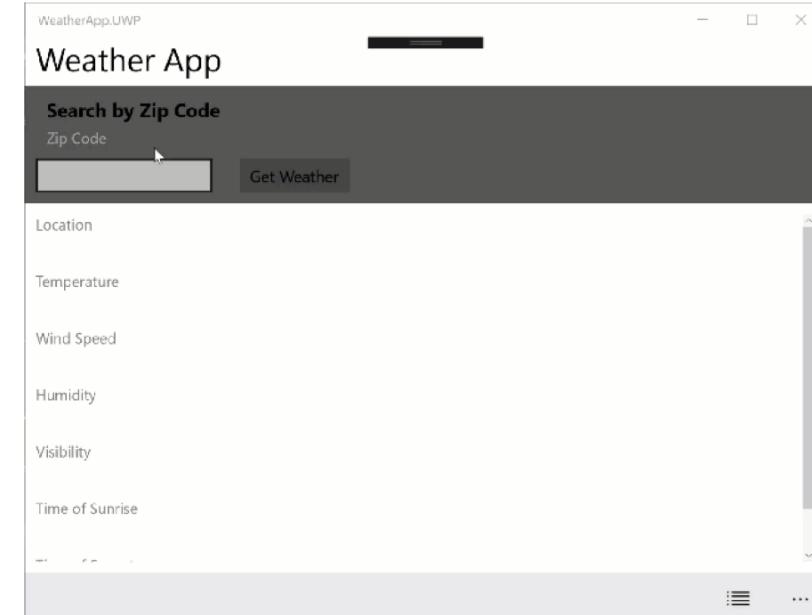
- Easily embed any page into a Xamarin Native Application



```
// Android  
Forms.Init(this, null);  
var androidFragment = new MyFormsPage().CreateFragment(this);
```

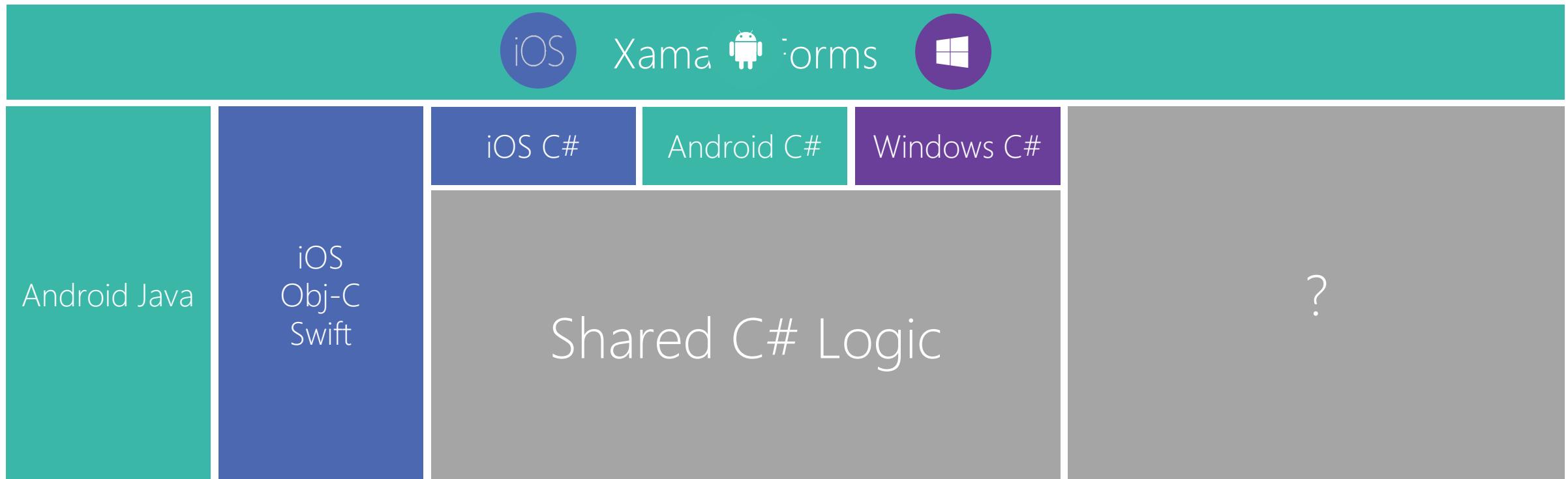
```
// iOS  
Forms.Init()  
var iosViewController = new MyFormsPage().CreateViewController();
```

```
// UWP  
Forms.Init(e);  
var uwpElement = new MyFormsPage().CreateFrameworkElement();
```



Embedding

- Works on ContentPages
- Full support for DependencyService and MessagingCenter



FlexLayout

- A CSS FlexBox inspired layout system
- Used for
 - Flowing items
 - Adaptive layout

FlexLayout Example

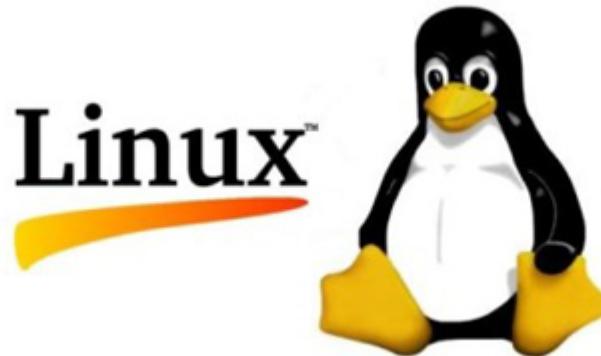
```
<?xml version="1.0" encoding="UTF-8"?>
<ContentPage xmlns="http://xamarin.com/schemas/2014/forms"
    xmlns:x="http://schemas.microsoft.com/winfx/2009/xaml
    x:Class="FormsFlexLayoutDemo.FlexDemoPage">
    <FlexLayout x:Name="flexbox">
        <Label Text="Flex Element 1" />
        <Label Text="Flex Element 2" />
        <Label Text="Flex Element 3" />
        <Label Text="Flex Element 4" />
        <Label Text="Flex Element 5" />
    </FlexLayout>
</ContentPage>
```



New Platforms

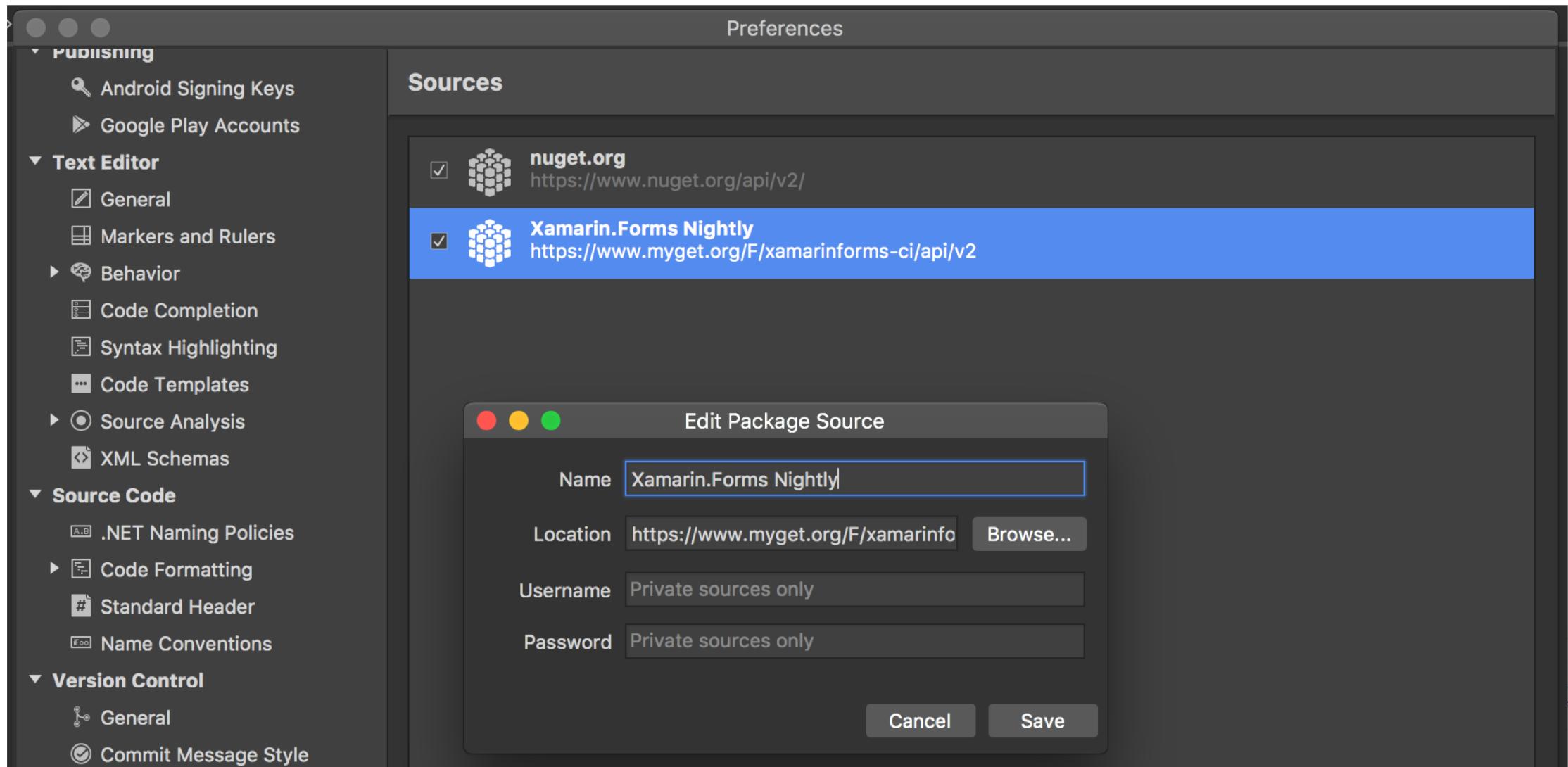
- Samsung Tizen
 - Televisions, Wearables, Mobile
- macOS
- WPF
- Linux: GTK#

macOS



Nightly Builds

<https://github.com/xamarin/Xamarin.Forms/wiki/Nightly-Builds>



Add XAML Compilation

Lab – app-quotes

Lab02 – exercise 4

Extending the app

Lab – app-quotes

Lab03