ArcGIS Runtime: Building Cross-Platform Apps

Mike Branscomb

Michael Tims

Tyler Schiewe

Agenda

- Cross-platform review
- ArcGIS Runtime cross-platform options
  - Java
  - Qt
  - .NET

Native vs Web

- **Native** strategies offer the best device integration and the most out-of-the-box functionality for connected and offline workflows, but they require native development skills. You can use ArcGIS Runtime SDKs to create native apps.

- **Web** strategies use HTML, JavaScript, and CSS hosted on a web server and delivered to the user's device or desktop using a web browser. This strategy is best for connected workflows if you don't know the devices your users have and you need to reach a wide audience. You can use the ArcGIS API for JavaScript to create web client solutions.

Cross-platform Native Application Considerations

- Benefits
  - Share application code
  - Enforces good design patterns
  - Makes your app available to more users
- Challenges
  - User experience of your app may vary
  - Handling platform idiosyncrasies (security, bugs, etc)
  - More testing
  - Development cost

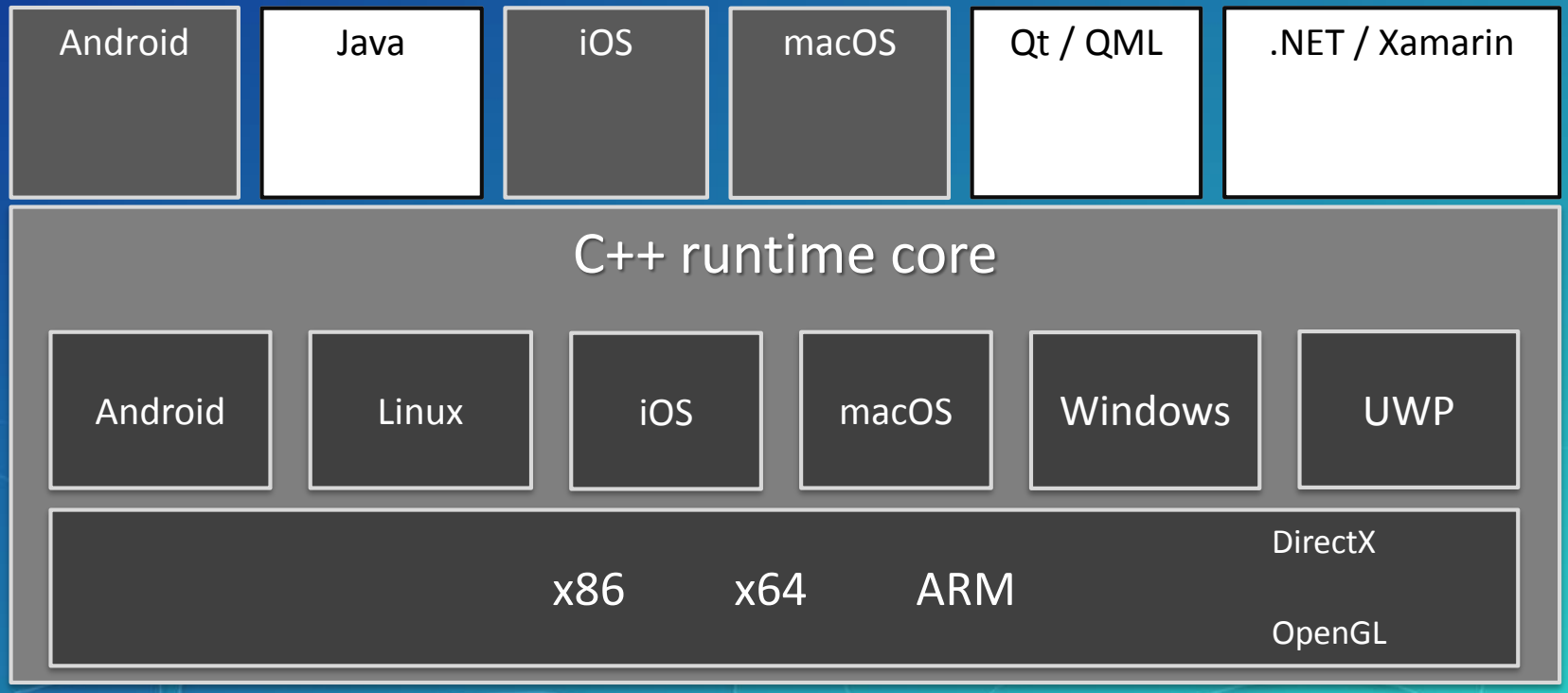
Building Native Apps on Multiple Platforms

- Which One is Right for Me?
  - Understand expectations of your users
  - Educate yourself and your team
  - Be prepared to learn something new

- Multiple players in the market
  - Java
  - Qt Company
  - Microsoft

ArcGIS Runtime Cross Platform Options

- All Runtime APIs built on common Runtime core



Java

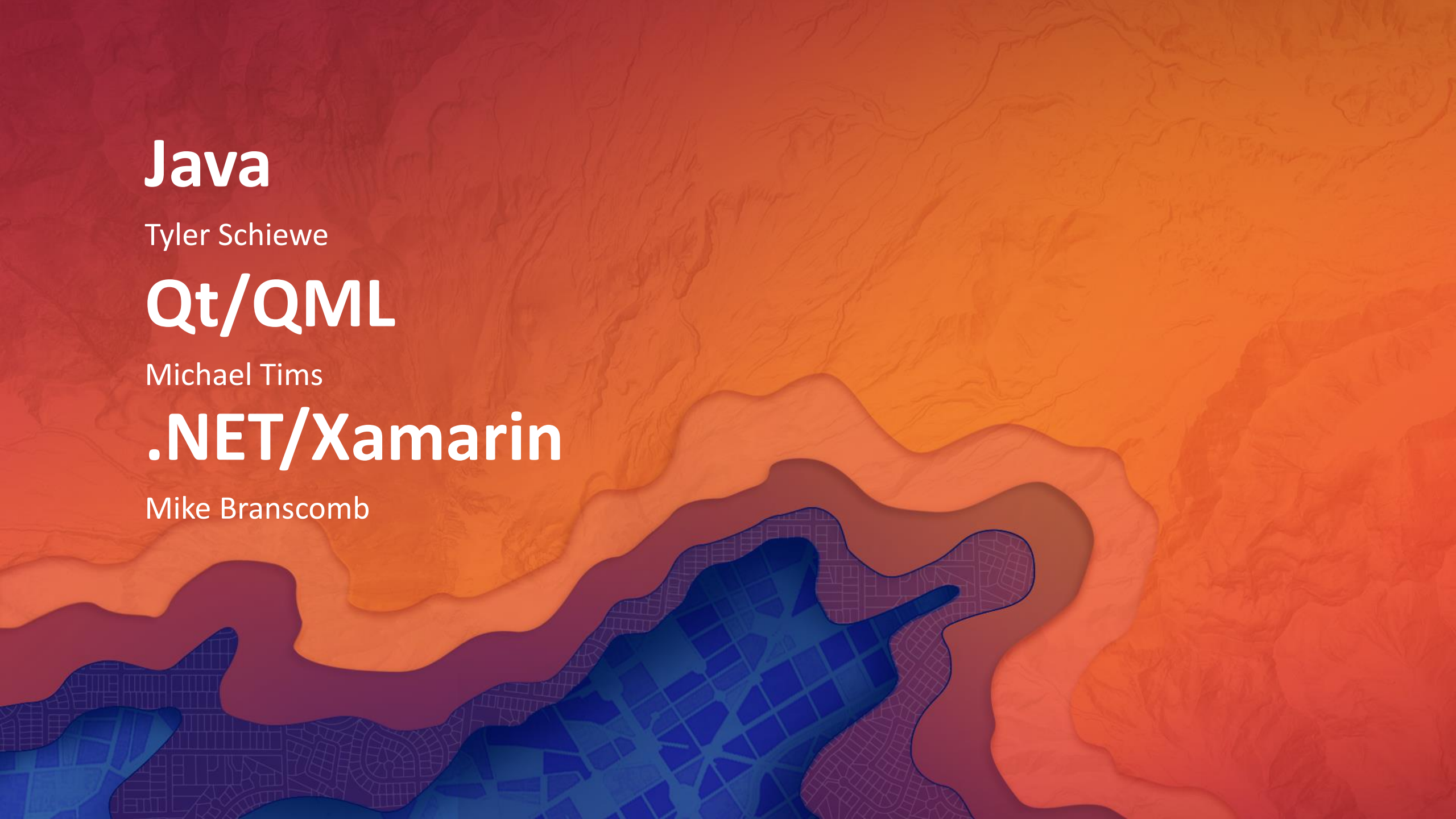
Tyler Schiewe

Qt/QML

Michael Tims

.NET/Xamarin

Mike Branscomb



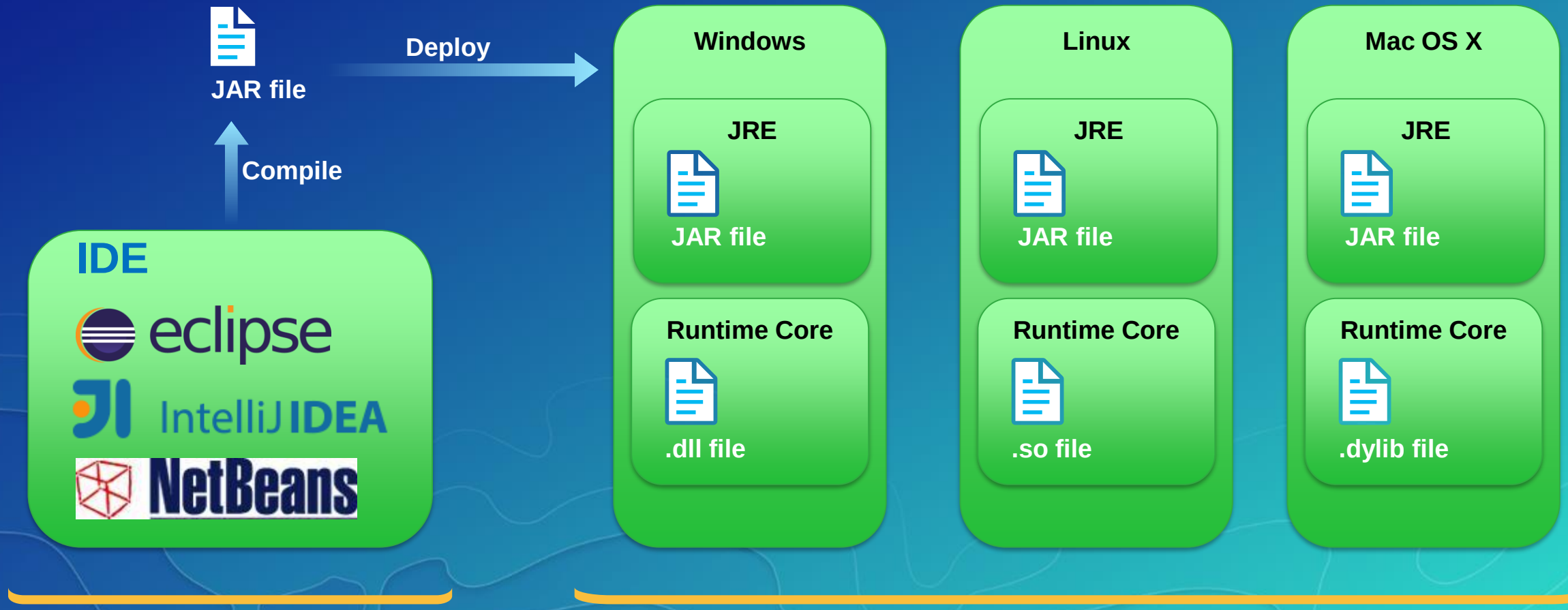
Java

Tyler Schiewe

Cross platform Java Development

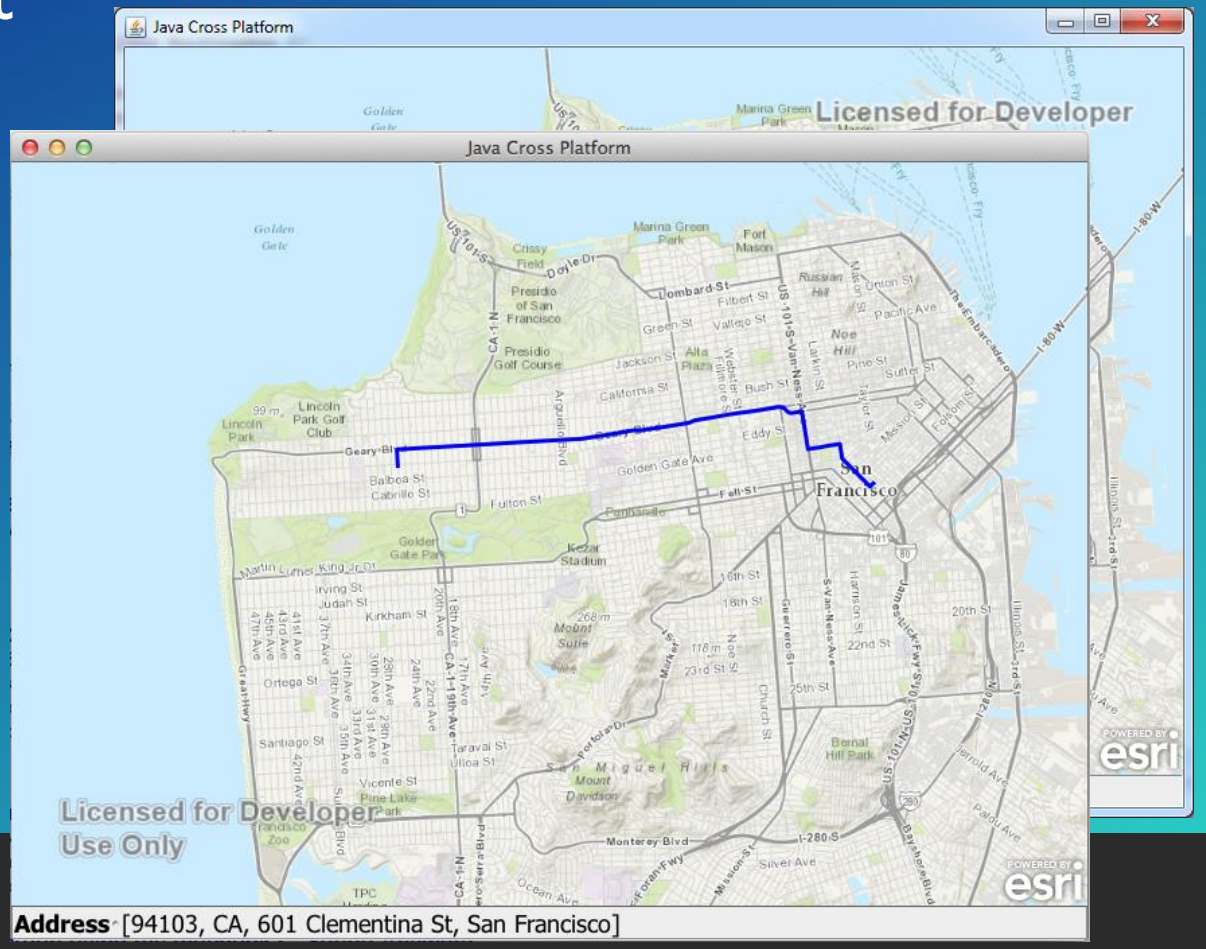
- "Write once, run anywhere"
- ArcGIS Java Runtime SDK is aimed at desktop platforms
- Sits on the ArcGIS Runtime core architecture (C++) via JNI
- JavaFX for building modern, native-looking GUIs
- Massive ecosystem of mature, open-source libraries to use

Development and Deployment



Cross platform Java Development

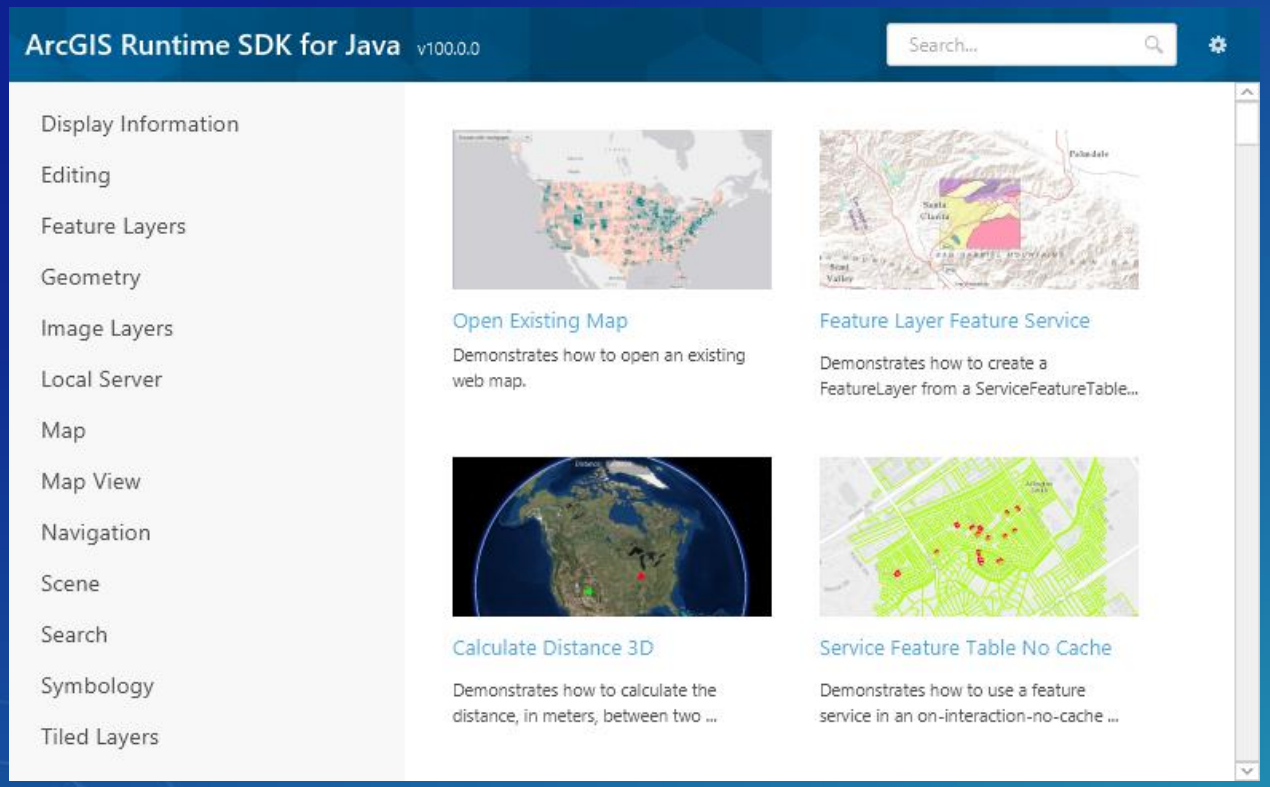
- Layout uses a native window
- Styling with CSS
- Optionally use markup for layout (FXML)



Be mindful of file paths

- C:\Users\Tyler\Projects\MyData.geodatabase
- /Users/Tyler/Projects/MyData.geodatabase

```
<StackPane fx:controller="com.esri.samples.mysample.SampleController"
          xmlns:fx="http://javafx.com/fxml" stylesheets="/css/style.css">
   <MapView fx:id="mapView"/> <!-- SDK control -->
   <HBox StackPane.alignment="TOP_CENTER" maxWidth="200" maxHeight="50" spacing="5" styleClass="panel-region">
      <Label text="Click me: "/>
      <Button fx:id="myButton" onAction="#myEvent"/>
   </HBox>
</StackPane>
```



Demo

An App for Windows, Linux, and Mac

```
javapackager -deploy -native -outdir packages -outfile SampleViewer
    -srcDir ./ -srcfiles java-se-sample-viewer-1.0.jar
    -srcfiles jniLibs -srcfiles resources -srcfiles samples-data
    -appclass com.esri.sampleviewer.App -name "SampleViewer" -title "Sample Viewer“
```

Summary

- Pros
  - IDE and JDK are free
  - Deployments can be identical for ALL platforms
  - JavaFX apps style for the platform
- Cons
  - Clients must have Java installed
  - Not targeted for mobile applications or web apps
  - “Verbose” syntax

Qt/QML

Michael Tims

Qt

The Qt Company – qt.io

- 20 Years in cross-platform development
- 1 Framework
  - Code once, run anywhere on any device
- Over 1 Million downloads of latest framework version
- 800,000 developers (indie, corporate) worldwide
- Open-source community
- Proven to speed time-to-market by 50% for cross-platform

Platform Support

ArcGIS Runtime SDK for Qt

***Future Release**

API	Windows	Linux	macOS	Android	iOS	WinUWP
C++	✓	✓	✓	✓	✓	✓
QML	✓	✓	✓	✓	✓	✓

1 SDK, 2 APIs

ArcGIS Runtime SDK for Qt

- C++ API
  - Qt Widgets for UI
  - Qt Quick (QML) for UI
  - Modern C++ language – C++ 11
  - Fast performance – direct binding to the Runtime Core (C++)

- QML API
  - Qt Quick (QML) for UI
  - Declarative language
  - Imperative JavaScript business logic code

QML API

Example QML code

Highly readable JSON/CSS-like syntax

Declarative UI elements

Imperative JavaScript Code to handle events

```
Rectangle {
    MapView {
        id: mv
        anchors.fill: parent
        Map {
            id: map
            BasemapStreetsVector {}
        }
    }
     Button {
        anchors {
            left: parent.left
            top: parent.top
        }
        text: "Zoom to Hawaii"
        enabled: map.loadStatus === Enums.LoadStatusLoaded
        onClicked: {
            var point = ArcGISRuntimeEnvironment.createObject("Point", {
                            x: -157.564,
                            y: 20.677,
                            spatialReference: SpatialReference.createWgs84() } );
            mv.setViewpointCenterAndScale(point, 4000000.0);
        }
    }
}
```

ArcGIS Runtime

Dynamic property binding

Qt SDK – System setup

Make time to setup your builds

- Compiler, SDK dependencies
  - iOS: Xcode compiler
  - Windows: Visual Studio compiler
  - Linux: GCC compiler
  - Android: Android NDK and SDK
- Setup once, same code across platforms
- IDE: Qt Creator - Cross-platform IDE
  - Design, develop, test, deploy from one tool

Qt SDK – ArcGIS Extras

Extra APIs provided

- UI display scale factor
  - Qt 5.6 brings out-of-the-box High-DPI support
- Core APIs exposed to QML
  - File IO
  - Application settings
  - AppStudio’s AppFramework also provides more functionality

Qt SDK – Coming soon…

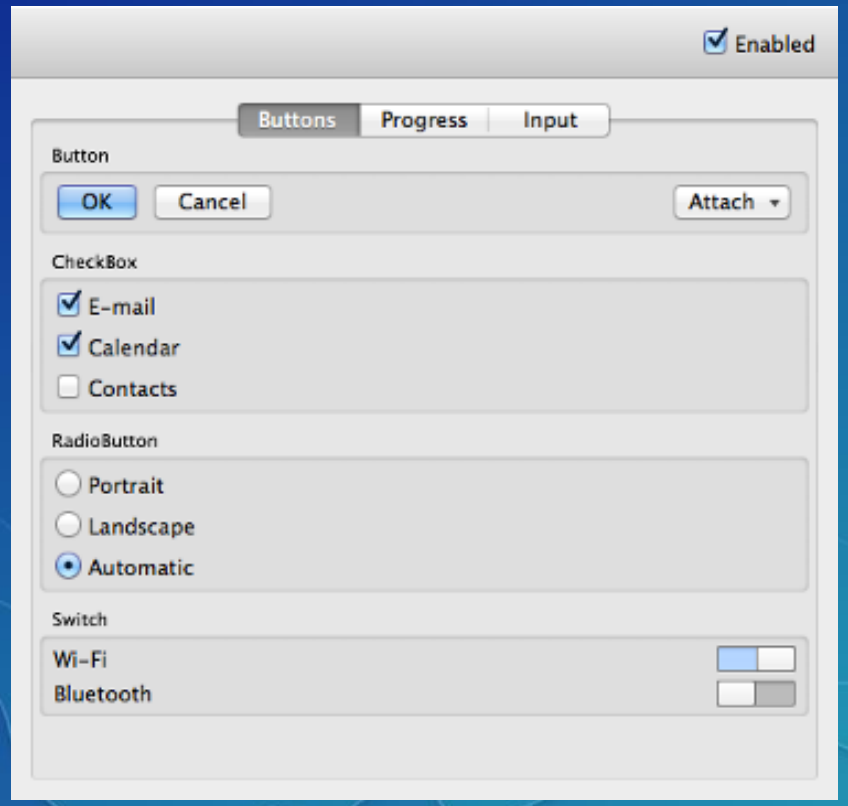
APIs not currently available in Qt framework

- Push notifications
- Qt Speech (text to speech) – Tech Preview
- Background/suspended location updates – Qt 5.9!
- Access photo gallery on Android

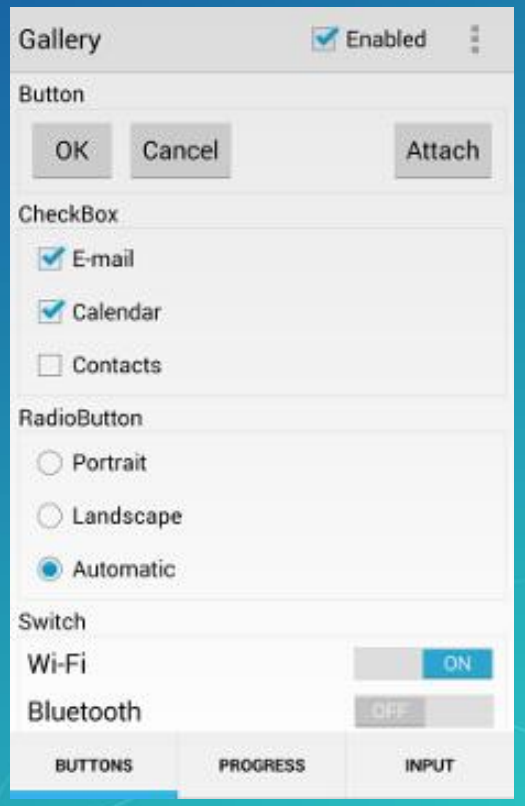
Qt Quick Controls

Out-of-the-box controls for QML

- **macOS**



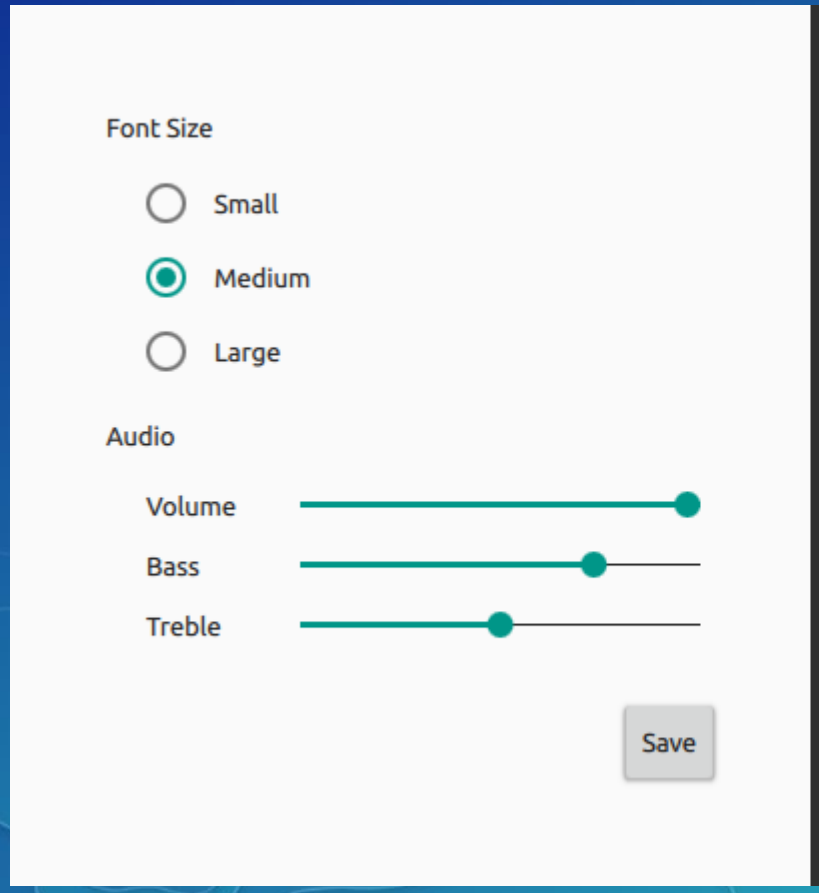
- **Android – Nexus 5**



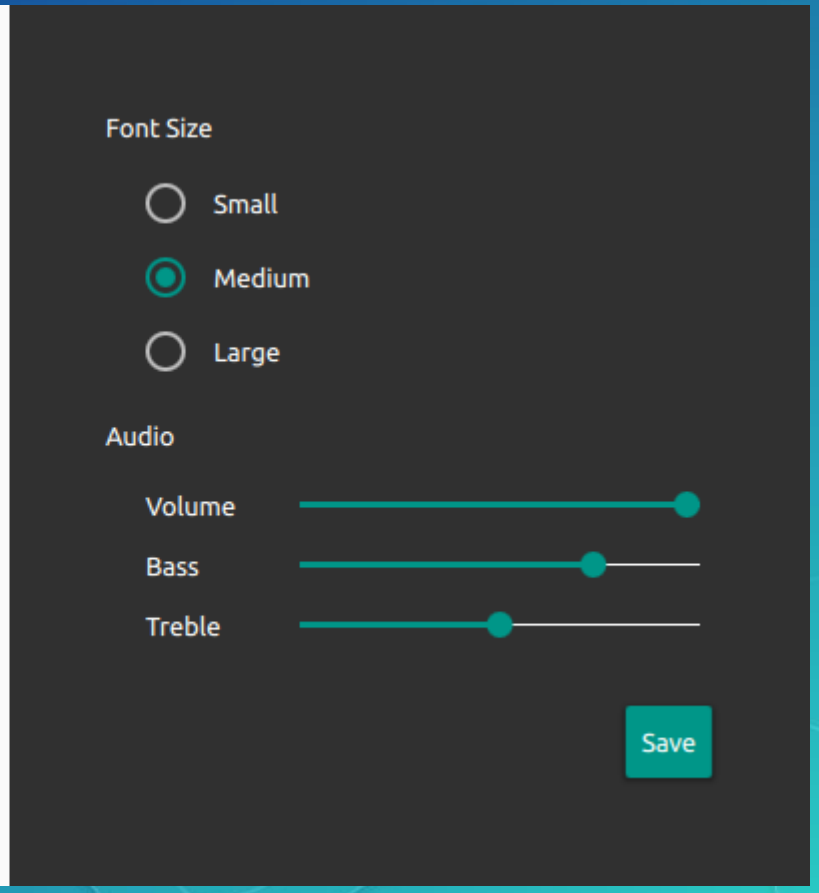
Qt Quick Controls 2

Common UI controls for QML

- **Material style (Google)**



- **Universal style (Windows)**



Qt SDK – Licensing

Open Source or Commercial Use

- Qt for Application Development license model
- Dual-licensed under commercial and open source licenses
  - Commercial
    - Full rights to create and distribute software
  - Open Source
    - Qt 5.6.x - LGPLv2.1
    - Qt 5.7.x and up - GPL and LGPLv3
- More information - http://www.qt.io/licensing

Qt SDK – Pros and Cons

APIs not currently available in Qt framework

- Pros
  - Same modules
  - Same code
  - Same workflow
  - Same look and feel
  - Access to device sensors
  - Open source community
- Cons
  - Incomplete / initial APIs from Qt
  - Common abstraction API for iPhone and Android SDKs
  - Look and feel of the native platform
  - Qt framework can increase apps size

.NET / Xamarin

Mike Branscomb

What is Xamarin?

- Xamarin
  - Based on the Mono runtime*
  - Compiles into a native Android or iOS app
  - Exposes ***all*** Android and iOS APIs

- Xamarin is not a cross-platform SDK. It's a cross-platform language (C#)
  - Most of .NET's core libraries are shareable code
  - UI code is very platform specific
  - Device code not shareable (Bluetooth, GPS, sensors etc)

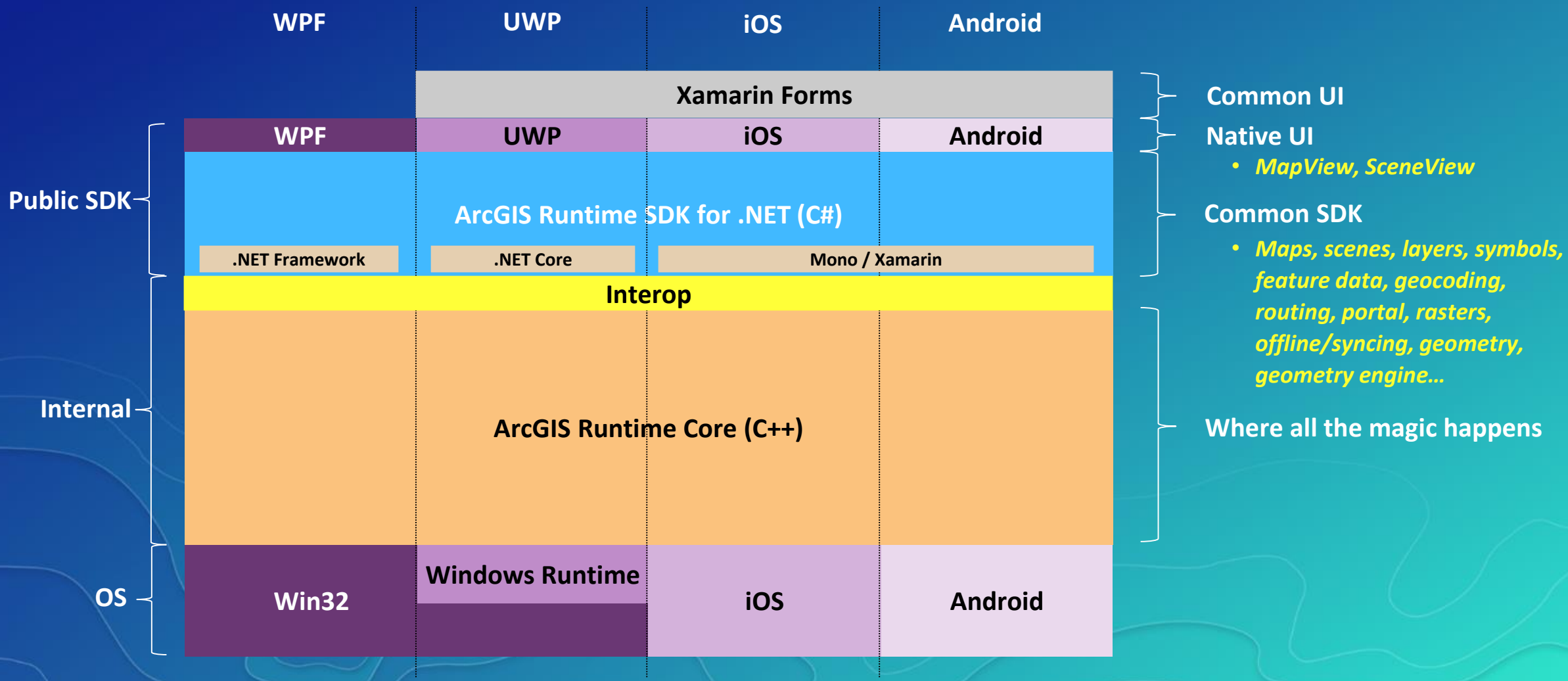
- Abstraction-libraries exist that simplifies this
  - Xamarin.Forms: Cross-platform UI framework which supports XAML
  - Lots of nuget-libraries

What is ArcGIS Runtime SDK for .NET

- Supports:
  - WPF
  - Universal Windows Platform apps (UWP)
  - Xamarin.Android
  - Xamarin.iOS
  - Xamarin.Forms (Android, iOS, and UWP)
- Exact same business logic code for all platforms.
  - Use native platform UI framework
  - Or use Xamarin.Forms abstraction to share UI logic as well

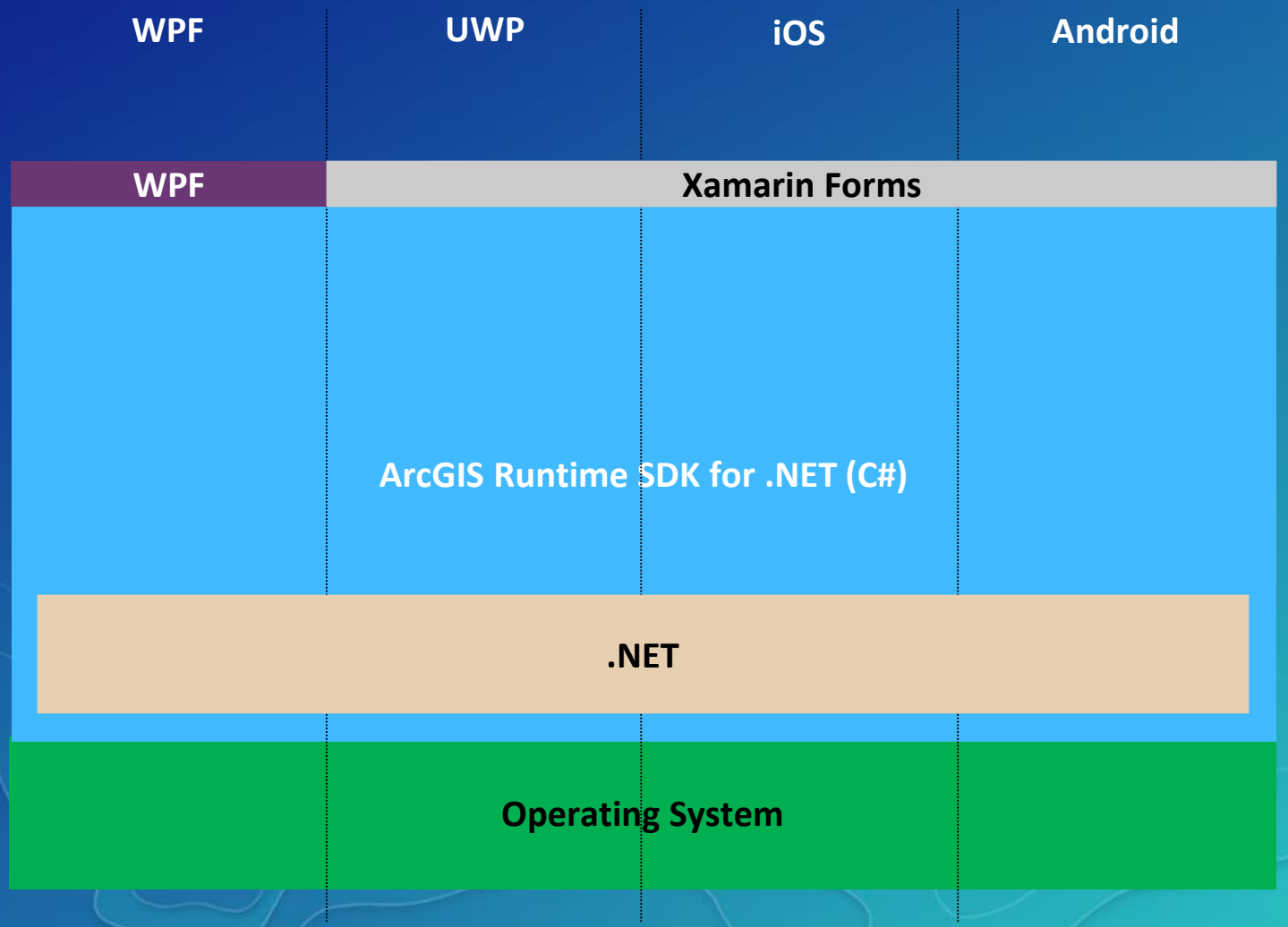
ArcGIS Runtime SDK for .NET & Xamarin

Architecture Diagram



ArcGIS Runtime SDK for .NET & Xamarin

A simpler view…



Native UI

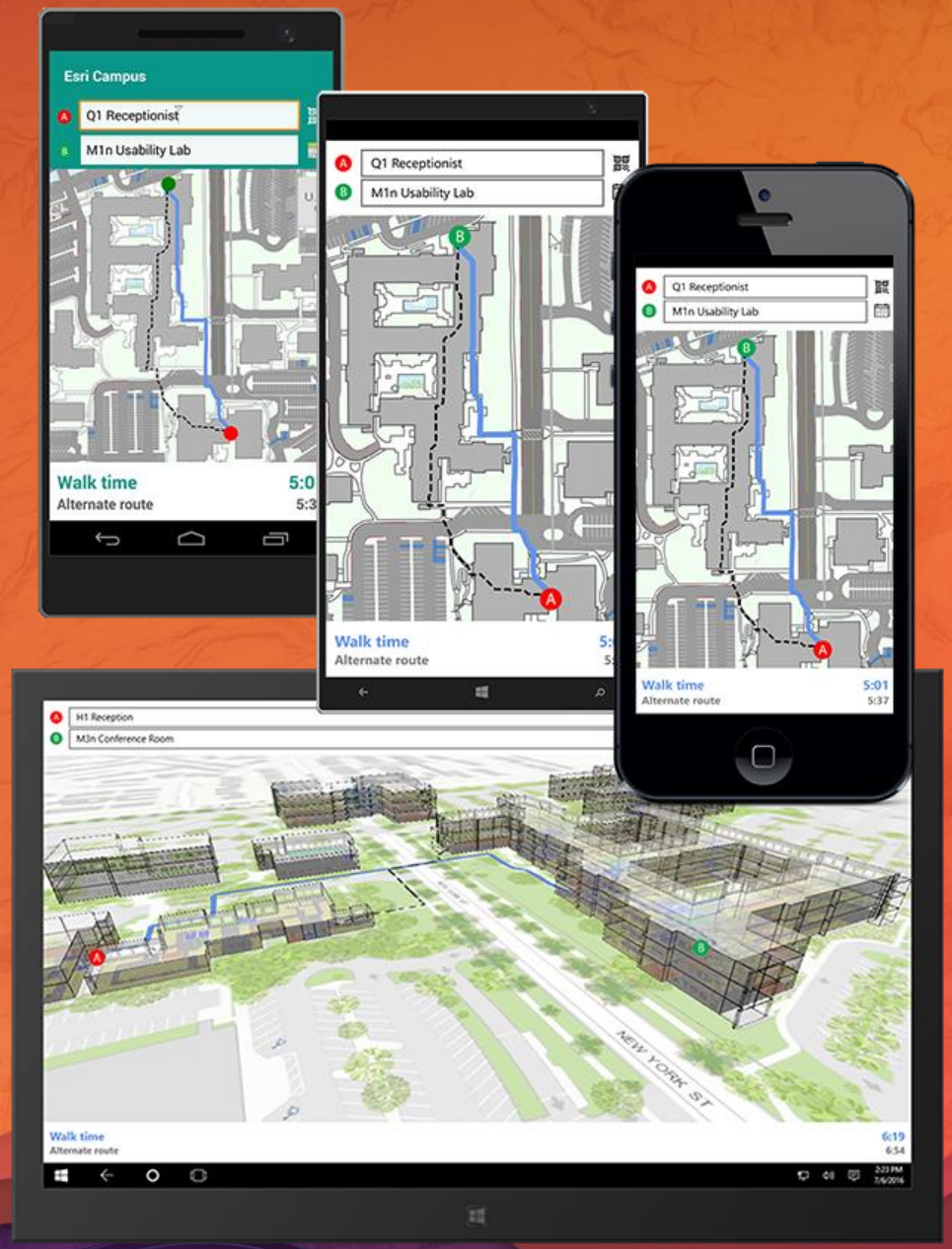
- *MapView, SceneView*

Common SDK

- *Maps, scenes, layers, symbols, feature data, geocoding, routing, portal, rasters, offline/syncing, geometry, geometry engine…*

Xamarin Demo

[Source: http://esriurl.com/XamarinRouting](http://esriurl.com/XamarinRouting)

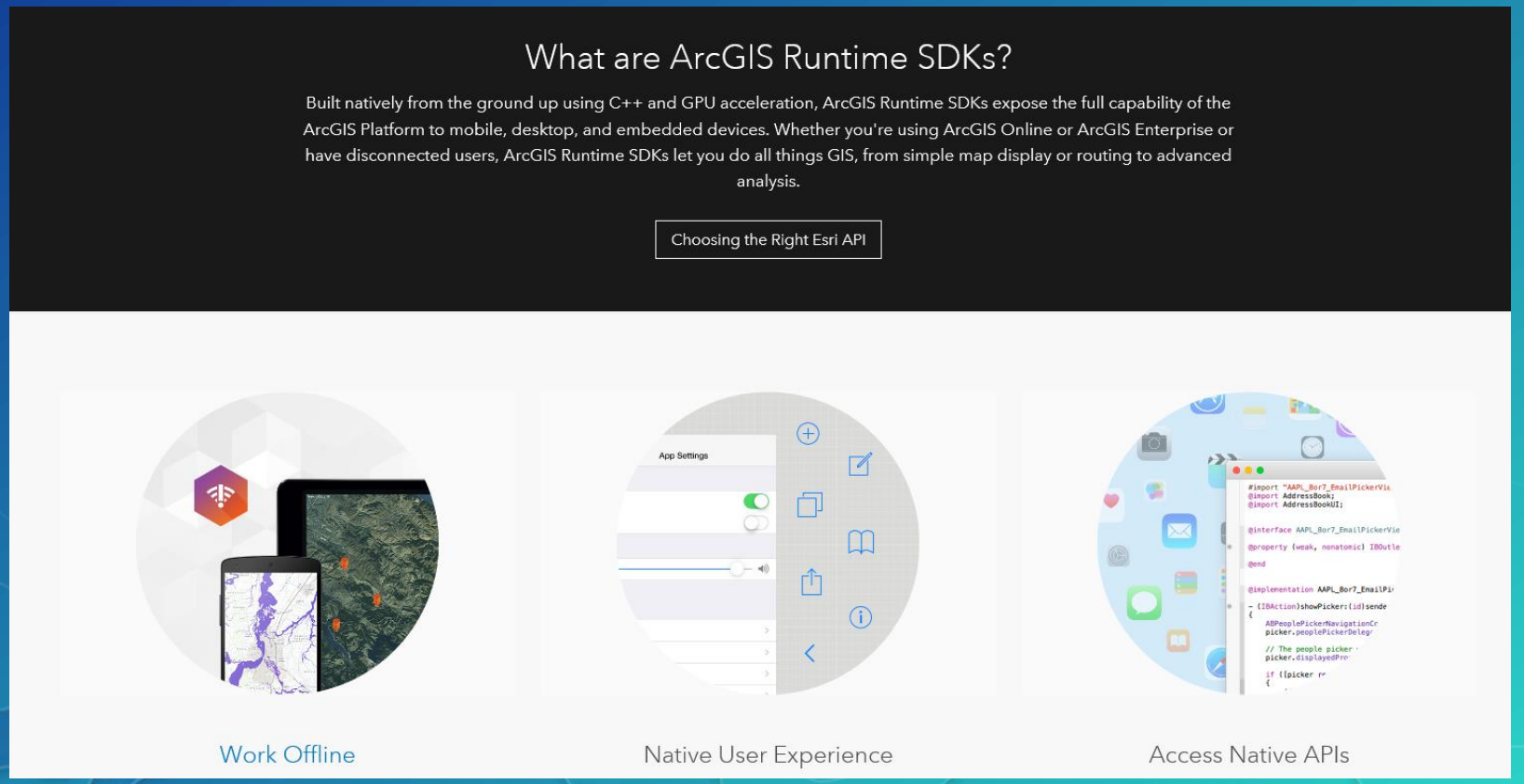


Pros and Cons

- **Pros:**
  - Xamarin is free and Open Source
    - Note: Visual Studio isn't free for most commercial uses though
  - Target all platforms in a single IDE (Visual Studio), on a single OS*
  - Full access to all native platform APIs
- **Cons:**
  - Not 100% abstraction of all platform code
  - Xamarin Tooling (while greatly improving) can be a little buggy
  - *You need a Mac for iOS deployment

Questions?

developers.arcgis.com/arcgis-runtime



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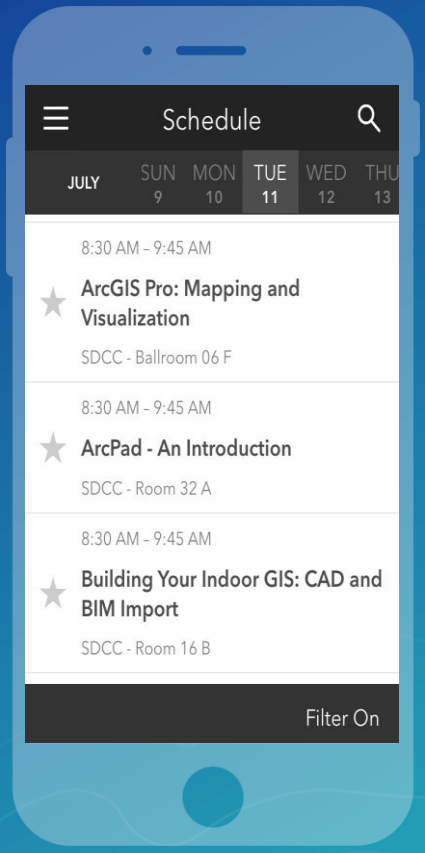
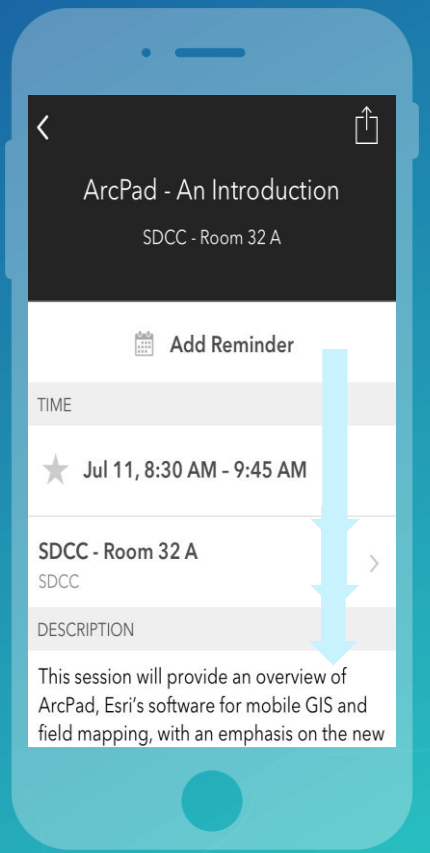
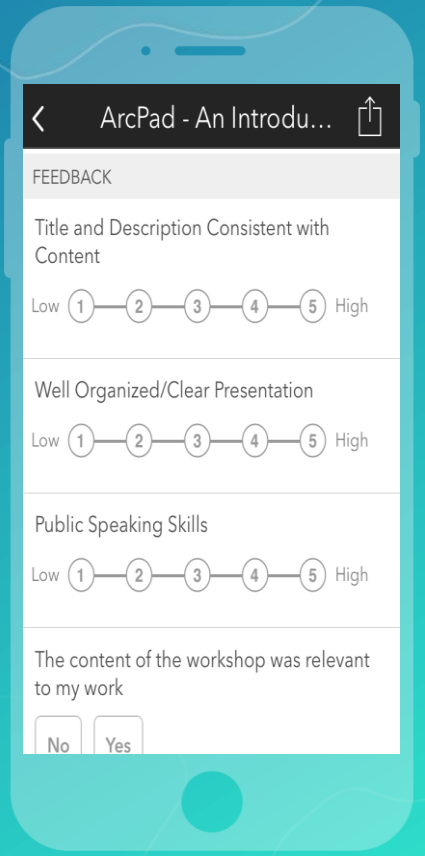


Scroll down to find the survey



Complete Answers and Select "Submit"

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