ArcGIS Runtime SDK for WPF

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Mark Baird
Agenda

• Introduction
• SDK
• Building the Map
• Query
• Spatial Analysis
• Editing and Geometry
• Programming Patterns
• Deployment and Licensing
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ArcGIS is a System

- Online
- Desktop
- Server
- Mobile
- Developer
- Solutions
ArcGIS Runtime

- Set of small, fast components
- Exploit capabilities of the operating system
- Integrate with ArcGIS System
ArcGIS Runtime SDK

- Client API for accessing ArcGIS Runtime capabilities
- Software developer kit for building applications with GIS
Web or Native applications?

• ESRI supports both

• Advantages of native applications
  - Tighter integration with other native apps
  - Access to resources
    • Contacts, calendar events, photos
  - Marketing/Hosting/Reporting via AppStore

• Disadvantages
  - Dedicated effort to write and maintain
Where does the ArcGIS Runtime fit in?

- ArcGIS Runtime
- ArcGIS Explorer
- ArcGIS Desktop
- ArcGIS Engine
- Map Objects
- ArcReader
<table>
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<tr>
<th>Benefits</th>
<th>ArcGIS Runtime</th>
<th>ArcGIS Engine</th>
<th>Map Objects</th>
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<td>Simple Object Model</td>
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<td>Accelerated Display</td>
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<td>Simple Licensing Model</td>
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<td>Geodatabase Read/Write</td>
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<td>ArcGIS Server &amp; Online Services</td>
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<tr>
<td>Support Rasters</td>
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<tr>
<td>Use Geoprocessing</td>
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<tr>
<td>Support ArcMap Cartography</td>
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<td>Annotations</td>
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<td>Symbols &amp; Styles</td>
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<tr>
<td>Side by Side SDK and Deployment</td>
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<tr>
<td>Deploy just what you need</td>
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### Apps and SDKs

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<tr>
<td>Linux</td>
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<td>Java</td>
</tr>
</tbody>
</table>

**Apps**
- ArcGIS
- ArcGIS Explorer

**Runtime SDK**
- .NET CF /.NET
- WPF, Java
- Silverlight
- Objective C
- Java
Apps and SDKs

Windows

Apps
ArcGIS
ArcGIS Explorer
Runtime SDK
WPF
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Getting started – ArcGIS Runtime SDK for WPF

- Build native apps for Windows devices

- Using…
  - .NET 4.0
  - WPF
  - XAML, C#, VB.NET
  - Visual Studio 2010 or Blend 4

- For:
  - XP x86 & x64
  - Vista x86 & x64
  - 7 x86 & x64

*Next release supports Windows 8 classic desktop & VS2012*
Getting started – ArcGIS Runtime SDK for WPF

• Part of ESRI Developer Network (EDN)
  - Subscribers – Download from EDN website (or get DVD)

• Install SDK

• Lays Down:
  - Central ArcGIS Runtime
  - API assemblies
  - Samples
  - Conceptual / API reference doc
  - VS & Blend integration
Demo: The SDK
Demo Summary

- Start Menu contains Sample App, help links and tools for licensing/deployment

- Resource Center
  - Questions – forums.arcgis.com
  - Enhancement requests – ideas.arcGIS.com

- Sample App

- IDE Integration
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• **Building the Map**
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Map Display

- 2D display
- ArcGIS cartography
- Content built up as Layers
- Navigation via mouse, keyboard shortcuts or touch
- Behaviours and Actions
  - e.g. ConstrainExtentBehavior, MeasureAction
Plan map content

- **Map Control**

- **Live Data**
  - Graphics and GraphicsLayer

- **Operational Data**
  - MapServices/MPKs, DynamicLayers/FeatureLayers

- **Basemap**
  - TPKs, online/local TiledLayers
Provisioning content

- Webmaps
- Add layers to map control via API
- Online / Local Content is authored through Desktop
  - Tiled map services / Tile Packages
    - High performance base maps
  - Dynamic map services / Map Packages
    - Editing, querying, mapping
  - Locator services / Locator Packages
    - Geocoding
  - Geoprocessing services / GP Packages
    - Models and Scripts
Demo: Building the Map
Demo Summary

• Build up map in layers
  - Tiled basemaps, dynamic operational, graphics

• Content authored in ArcGIS for Desktop
  - For services or for packages
UI Components

• Toolkit assembly contains UI controls
  - Navigation e.g. Bookmark
  - Editing e.g. TemplatePicker
  - Security e.g. SignInDialog

• Can customize controls or extend using Toolkit source code on Codeplex.
Accelerated Display

- High Performance DirectX Map Rendering Engine
- Supports all Tiled and Dynamic Layer Types
- Supports Feature & Graphics Layers with ESRI Symbols
  - SimpleMarker, PictureMarker, SimpleLine, SimpleFill
  - No custom symbols defined via control templates
- Default rendering engine is Standard WPF
  - Apps built with existing 2.X ArcGIS API for WPF will continue to work
- Start with the hardware accelerated display for whole map and just use the standard WPF rendering where required (e.g. custom/animated symbols).
Accelerated Display

- High Performance DirectX Map Rendering Engine
  - Enable for all layer via map property
    
    ```xml
    <esri:Map x:Name="_mapControl" UseAcceleratedDisplay="True">
        _mapControl.UseAcceleratedDisplay = true;
    </esri:Map>
    ```

  - Enable for specific set of layers via AcceleratedDisplayLayers group layer
    
    ```xml
    <esri:AcceleratedDisplayLayers>
      <esri:ArcGISTiledMapServiceLayer ID="arcGISTiledMapServiceLayer"
          Url="http://services.arcgisonline.com/ArcGIS/rest/services/World_Topo_Map/MapServer" />
    </esri:AcceleratedDisplayLayers>
    ```

    ```csharp
    AcceleratedDisplayLayers acceleratedDisplayLayers = new AcceleratedDisplayLayers();
    acceleratedDisplayLayers.ChildLayers.Add(_baseMap);
    _mapControl.Layers.Add(acceleratedDisplayLayers);
    ```
Using the Accelerated Display Layers group

<Map>

<AcceleratedDisplayLayers>

</AcceleratedDisplayLayers>

</Map>
The GPS Layer

• A Graphics Layer that can be Added to a Map
• In ESRI.ArcGIS.Client.Toolkit.DataSources
• Displays Data from a GeoPositionWatcher
• Support NMEA Sentences
• By default uses device location
  - Windows 7 / Windows 8 have a location and sensor platform
  - FileGpsCoordinateWatcher
  - SerialPortGpsCoordinateWatcher
• Can implement custom GeoPositionWatchers
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Querying Data

• Task based framework
  - Async (and Sync if required)

• Task types
  - Identify Operations
  - Attribute and Spatial Queries
  - Geocoding and Reverse Geocoding

• Handled by Specific Task Classes in the ESRI.ArcGIS.Client.Task Namespace

• Similar Programming Pattern for Each Task
  - Define input Parameters
  - Execute task asynchronously
  - Process and display results
Demo: Querying Data
Demo Summary

- Querying data is task based
- Same dev pattern
- Async for good behavior
- Online and offline
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Spatial Analysis in the Runtime

- Geoprocessing is the source of advanced GIS analysis in the ArcGIS Runtime
- Connected – ArcGIS Server’s and ArcGIS Online’s Published Services
- Disconnected – Geoprocessing Packages (GPKs)
Geoprocessing Demo
Demo Summary

- Analysis provided by geoprocessing
- Same dev pattern as for other tasks
- Async for good behavior
- Online and offline
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Editing Features

- ArcGIS Runtime Editing
  - Data in a Map Package
  - Features from a Feature Service
- Edit in Connected and Disconnected Mode
- The SDK includes:
  - UI controls / widgets for editing
  - Fine-grained API components
- Edit environment authored in ArcGIS for Desktop
Runtime Geodatabase Editing Options

• Office-based connected scenarios
  - Edit RDBMS
  - Edit Feature Services via ArcGIS for Server and ArcGIS Online.

• Field disconnected scenarios
  - Edit File Geodatabases deployed to device with application
Authoring maps for editing

- Add just the editable layers to the map document
- Choose map coordinate system wisely
- Set layer and table properties
  - Define symbology
  - Field properties (aliases, visibility)
  - Define feature templates
  - Set subtypes and attribute domains
  - Layer description / copyright
  - Attachment support
  - HTML popups
Editing Demo
Demo Summary

• Editing provided by feature services

• Author content in ArcMap

• Online and offline

• UI controls and components
Geometry Service / API

• ArcGIS Runtime SDKs have a local, lightweight geometry capability

• Geometric calculations and utility methods
  - Buffer, clip, distance, project, densify, relate, simplify, union, difference, disjoint, symmetric difference…

• For Editor widgets / controls geometry services help perform common editing operations e.g. cutting and reshaping features
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User Experience – Asynchronous Patterns

- API has an Asynchronous Programming Model
- Application Responsiveness is Paramount
- Async Lets You:
  - Perform time-consuming tasks in the background
  - Execute multiple operations simultaneously
  - Wait for resources to become available without hanging your application
- Event Based Async Pattern
  - ExecuteAsync(…) / ExecuteCompleted
- Synchronous methods available but should be reserved to special cases e.g. Console Application
Runtime Local Server Utility

- **Local Server Utility**
  - Enable logging
  - Enabling capture of HTTP traffic
  - Port admin
  - Error reports
- **Launch from Start Menu**
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- **Deployment and Licensing**
Preparing to Deploy

- License the Application with an ArcGIS Runtime deployment license string
  - Take note of ArcGIS for Desktop analyser warnings
  - Ensure it’s the correct level and includes any extensions
- Make sure the license string is not accessible via reflection e.g. use obfuscation.
- Create an ArcGIS Runtime Deployment
- Select the Client Assemblies Required
  - in the build output directory
Deploy only what you need

- **Core**
  - 2D Mapping
    - Full ArcGIS cartographic model
  - Enterprise and File Geodatabases
    - Simple feature & attribute editing
    - ArcGIS Server services
- **Geocoding**
- **Geoprocessing**
- **Python scripting**
- **Additional Data Formats**
  - SDE Direct Connect, Rasters, Shapefile,…
- **Additional Projection Support**
- **GPS**
Licensing for deployment

• **Basic**
  - Full client to ArcGIS Server services
  - Local Tile Packages & GPS Support

• **Standard**
  - Local Map, Geoprocessing and Locator Packages
  - Geodatabase Editing & Routing

• **Extensions**
  - Spatial Analyst, 3D Analyst, Network Analyst

• Determine the Type and Number of Licenses
• Purchase Runtime Licenses
Demo: Deploying an App
Demo Summary

- Identify functionality you need
- Determines deployment size
- Determines license
- Easy to deploy
  - XCopy, ClickOnce, Setups, etc
Resources

• The Resource Center
  - Concept doc, API ref, sample code, forums, blogs…

• Sample Application
  - Installed with SDK
  - Download from ArcGIS.com
    - http://www.arcgis.com/home/item.html?id=dbf41ae50a9548f5a799a157aa1c8c71
Roadmap – Winter release

- Display improvements
- New layer types
- Security enhancements
- Deployment enhancements
- Additional platform/IDE support
  - Support for Windows 8 desktop and VS2012
Roadmap – 2013

• Configurable applications
• 3D
• Edit sync framework
• New ArcGIS Runtime SDKs for Windows 8 and WP8
  - Support for Windows 8 modern UI style and ARM processor
ArcGIS Application for the Windows Store

- ArcGIS App built using ArcGIS Runtime and Windows 8 modern UI
- Preview app – demonstrates ArcGIS Runtime components running in an app designed for Windows 8
- Available in Windows Store now
- Esri Resource Center:
Thank you for attending

Questions?

Talk to us at the social…

mbranscomb@esri.com

Forums.arcgis.com
Ideas.arcgis.com