AR/VR in ArcGIS
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VR - Virtual Reality

Being there
AR - Augmented Reality

Interacting with outside world
MR - Mixed Reality

Mixed presence

Microsoft HoloLens & Magic Leap
AR/VR Market Trends

Revenue by year and platform

Enterprise use of AR by industry

* Statistics from Digi-Capital
XR with ArcGIS

**Esri CityEngine**

- **Import**
- **Sync**
- **Stream**

**Planned: streaming from ArcGIS Online/Enterprise into game engines**

**Datasmith**

**FBX**

**3VR**

ArcGIS 360 VR
- out-of-the-box mobile VR for Samsung Gear
- **planned: support for Oculus Go**

CityEngine VR Template for Urban Planning
- out-of-the-box premium XR experience

Game engine
- as XR dev environment
- **planned**

ArcGIS Runtime
- as AR dev environment
- best suited for mobile AR
Augmented Reality in the ArcGIS Runtime

- ArcGIS Runtime is AR enabled for iOS and Android devices
- Customization, configuration, and calibration
- Combination of:
  - Low-level API features
  - Open source Toolkit components to help build on top of the base API provided
- New AR view component
  - Build on the existing SceneView and 3D capabilities
- Use AR view with device sensors such as a compass and camera
AR Toolkit

- Native iOS - [Toolkit repo on GitHub](#)
- Native Android - [Toolkit repo on GitHub](#)
- iOS and Android through .NET/Xamarin - [Toolkit repo on GitHub](#)
What are ARKit and ARCore?

**ARSceneView** uses a ArcGISRuntime **SceneView** in Combination with an ARKit or ARCore view

- Google and Apple’s respective Augmented Reality frameworks
- Use the smartphone’s camera to add interactive (virtual) elements to an existing environment
Motion Tracking with ARCore/ARKit

Absolute Accuracy:
- GPS: ~10m
- Wi-Fi: ~2m
- Beacon: ~1m
- RFID: ~1m

Relative Positioning with ARCore/ARKit
- Camera information
  - Visual Place Recognition, Local Feature Descriptors
- Inertial Measurements
Enable your app for AR using AR Toolkit

1. Install AR Toolkit (and Runtime SDK)
2. Add an ARSceneView to your app
3. Configure privacy and permissions
4. Now you're ready to add tabletop AR, add flyover AR, or add world-scale AR to your app.
Supported Scenarios

- Flyover
- Tabletop
- World-scale
Flyover

- Use augmented reality (AR) to quickly explore a scene
- e.g. Explore a city by walking through it virtually
Tabletop: AR data exploration
World-scale: AR navigation
World-scale: AR field operations
ArcGIS Runtime features to “deal with”

- Scene view space effect control
- Scene view atmosphere effect control
- Surface transparency
- Scene view navigation constraint
## ArcGIS Runtime features to “deal with”

<table>
<thead>
<tr>
<th>AR pattern</th>
<th>Origin camera</th>
<th>Translation factor</th>
<th>Space effect</th>
<th>Atmosphere effect</th>
<th>Base surface</th>
<th>Navigation Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flyover</td>
<td>Above the tallest content in the scene</td>
<td>A large value to enable rapid traversal; 0 to restrict movement</td>
<td>STARS</td>
<td>REALISTIC</td>
<td>Displayed</td>
<td></td>
</tr>
<tr>
<td>Tabletop</td>
<td>On the ground at the center or lowest point on the scene</td>
<td>Based on the size of the target content and the physical table</td>
<td>TRANSPARENT</td>
<td>NONE</td>
<td>Optional</td>
<td>Will interfere if the user attempts to look at the scene from below</td>
</tr>
<tr>
<td>Worldscale</td>
<td>At the same location as the physical device camera</td>
<td>1, to keep virtual content in sync with real-world environment</td>
<td>TRANSPARENT</td>
<td>NONE</td>
<td>Optional for Calibration</td>
<td>Allow subsurface navigation to use underground</td>
</tr>
</tbody>
</table>