

VR and AR in ArcGIS: An Introduction

Adrien Meriaux, Eric Wittner, Rex Hansen, Taisha Waeny



2018 Esri UC | San Diego, CA

Agenda

- Product Overview and Terminology - Taisha
- Mobile VR and AR – Eric
- Introduction to Gaming Engines – Covered Earlier
- AR with ArcGIS Runtime – Adrien (gone to France) and Rex

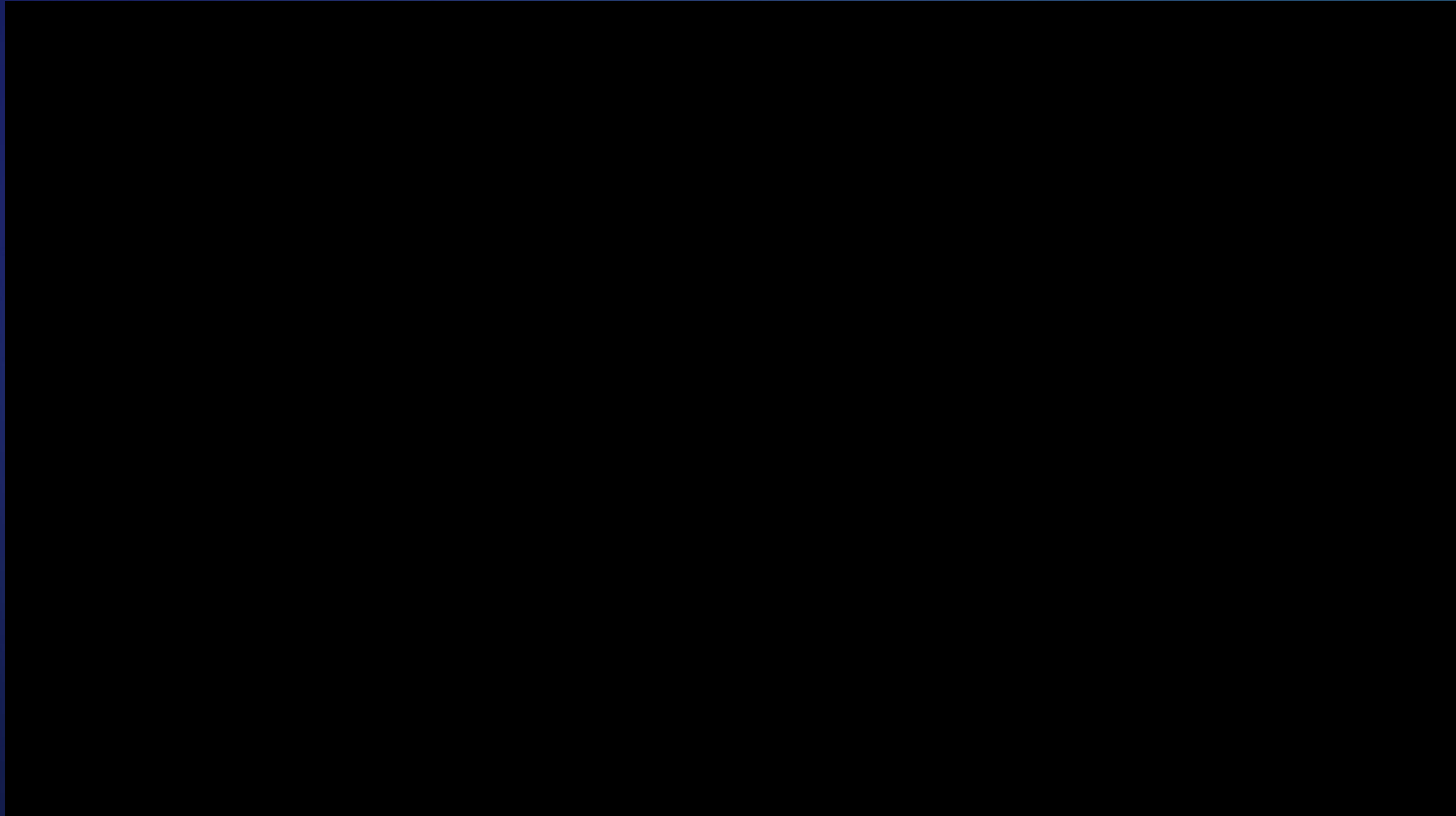
AR

The background features a dark blue gradient that transitions into a lighter teal at the bottom. The lower portion of the image is filled with a complex, abstract composition of overlapping geometric shapes, including rectangles, triangles, and lines. These shapes are rendered in various shades of blue, teal, and light green, creating a sense of depth and movement. Some elements appear to be layered on top of others, while others are partially obscured, giving the overall effect a dynamic and futuristic feel.

AR - Augmented Reality

Interacting with
outside world

Mobile Devices



Global Positional Tracking



Accuracy:

- GPS: ~10m, outside-only
- Wi-Fi: ~2m
- Beacon: ~1m
- RFID: ~1m

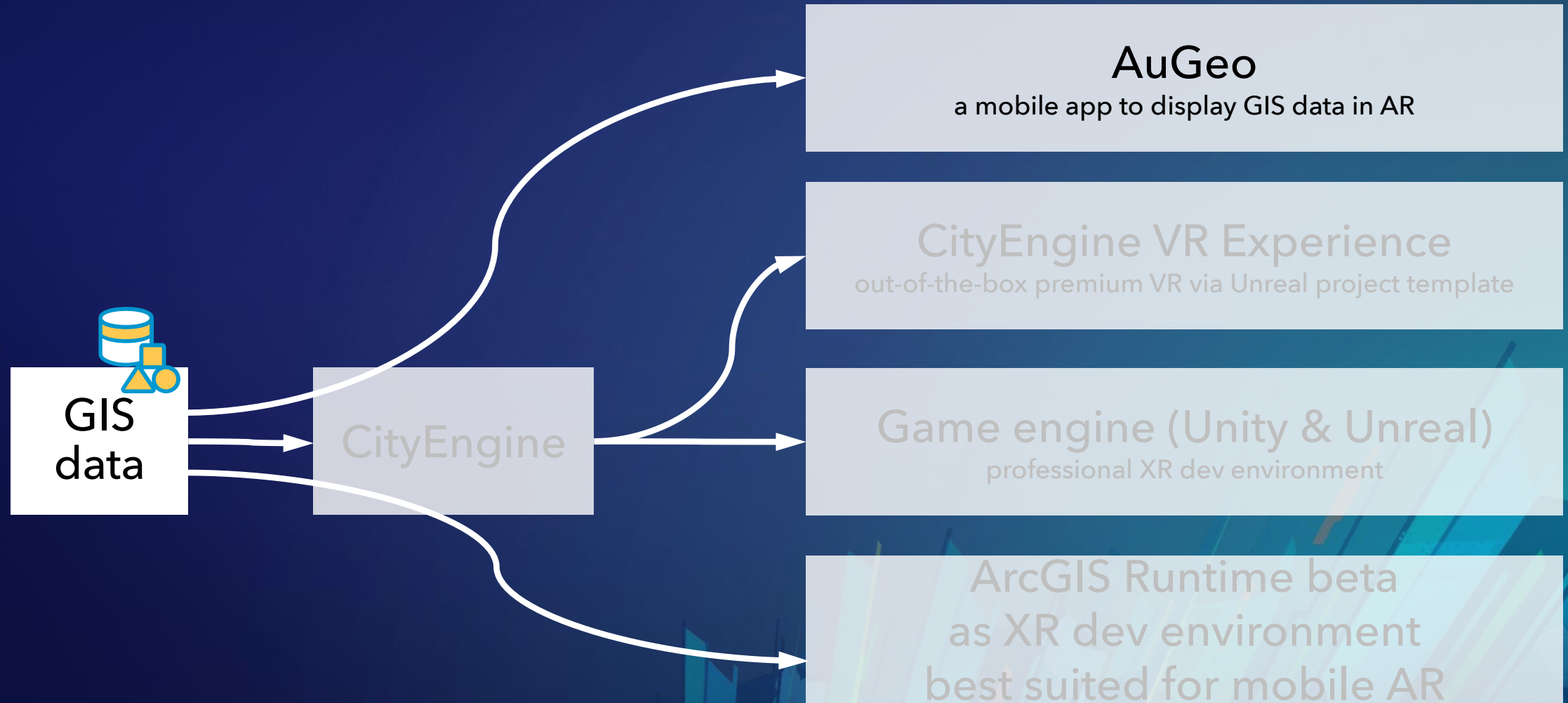


Standard AR

AR with ArcGIS Runtime



Mobile AR



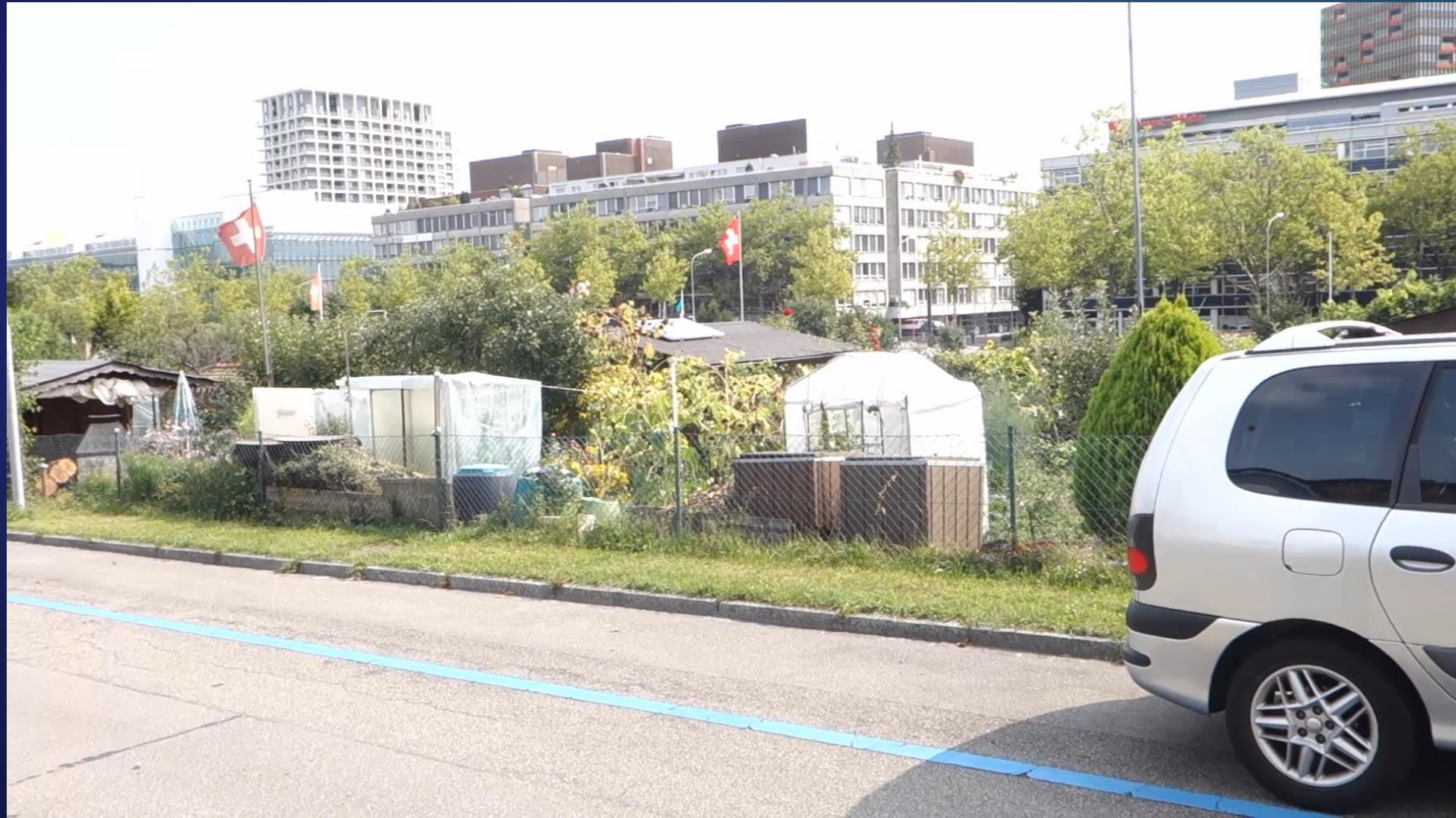
MR



MR – Mixed Reality

Mixed
presence

*Microsoft
HoloLens &
Magic Leap*



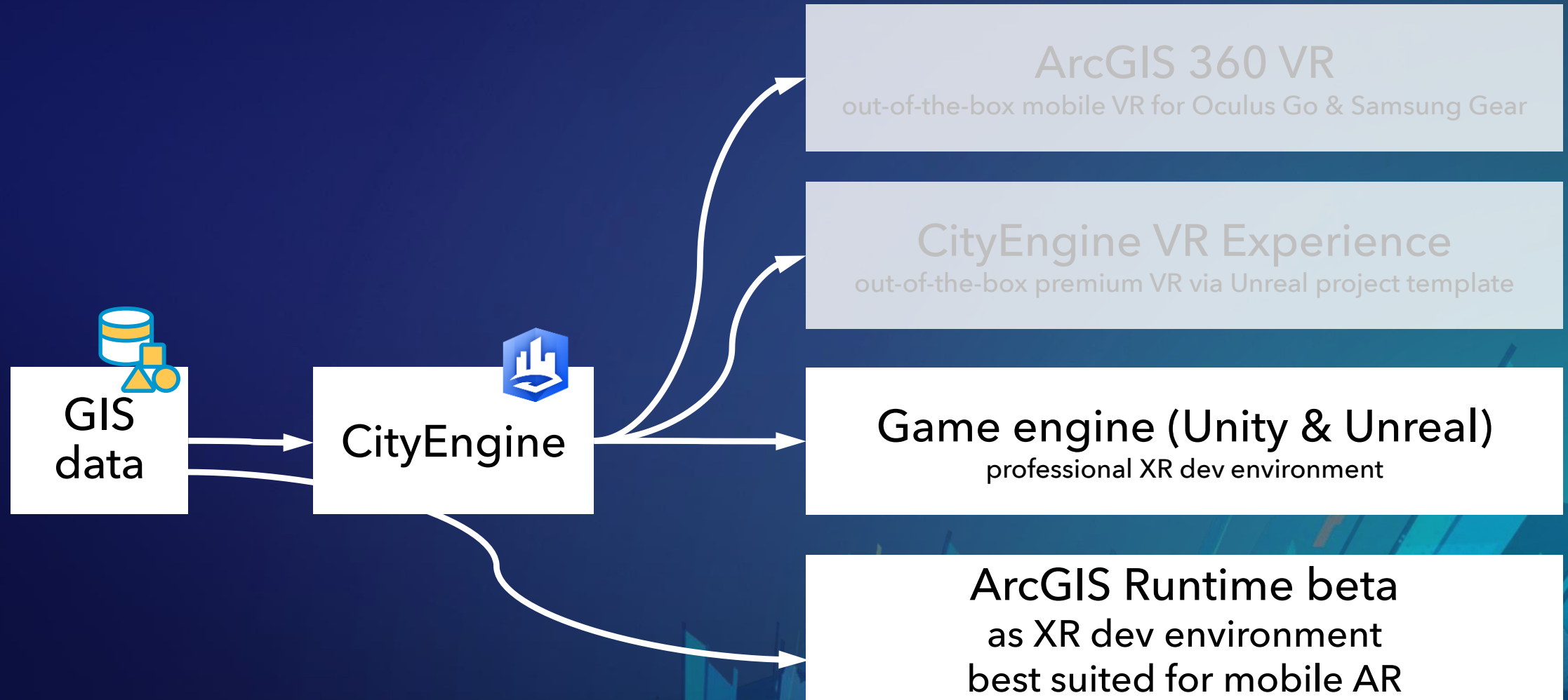
Global Positional Tracking

Challenge for phones and AR/MR headsets:

- Inside-out motion tracking, but
- Needs initial position



MR with CityEngine



VR

The background features a dark blue gradient on the left that transitions into a lighter teal on the right. In the bottom right corner, there is a complex, abstract composition of overlapping geometric shapes, including rectangles and lines, in various shades of blue, teal, and light green. Some of these shapes have thin, bright orange or yellow lines running through them, creating a sense of depth and movement.

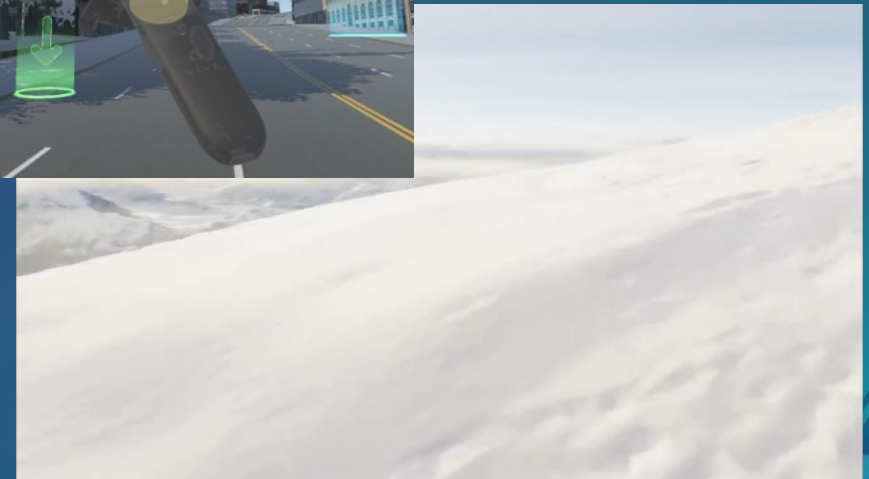
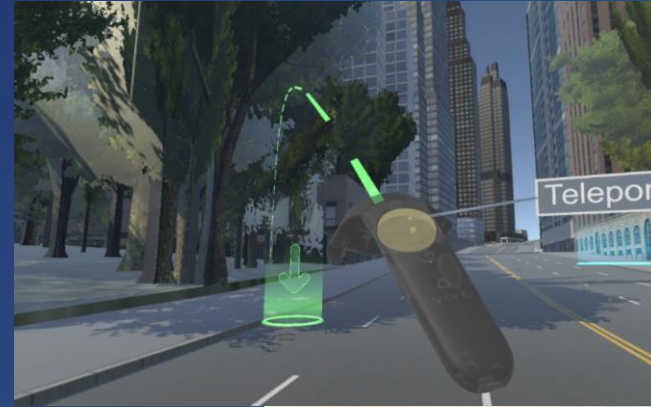
VR - Virtual Reality

Being there

HMD



Locomotion & Teleportation



→ *motion sickness is major problem for adoption of VR*

Mobile VR versus Premium VR

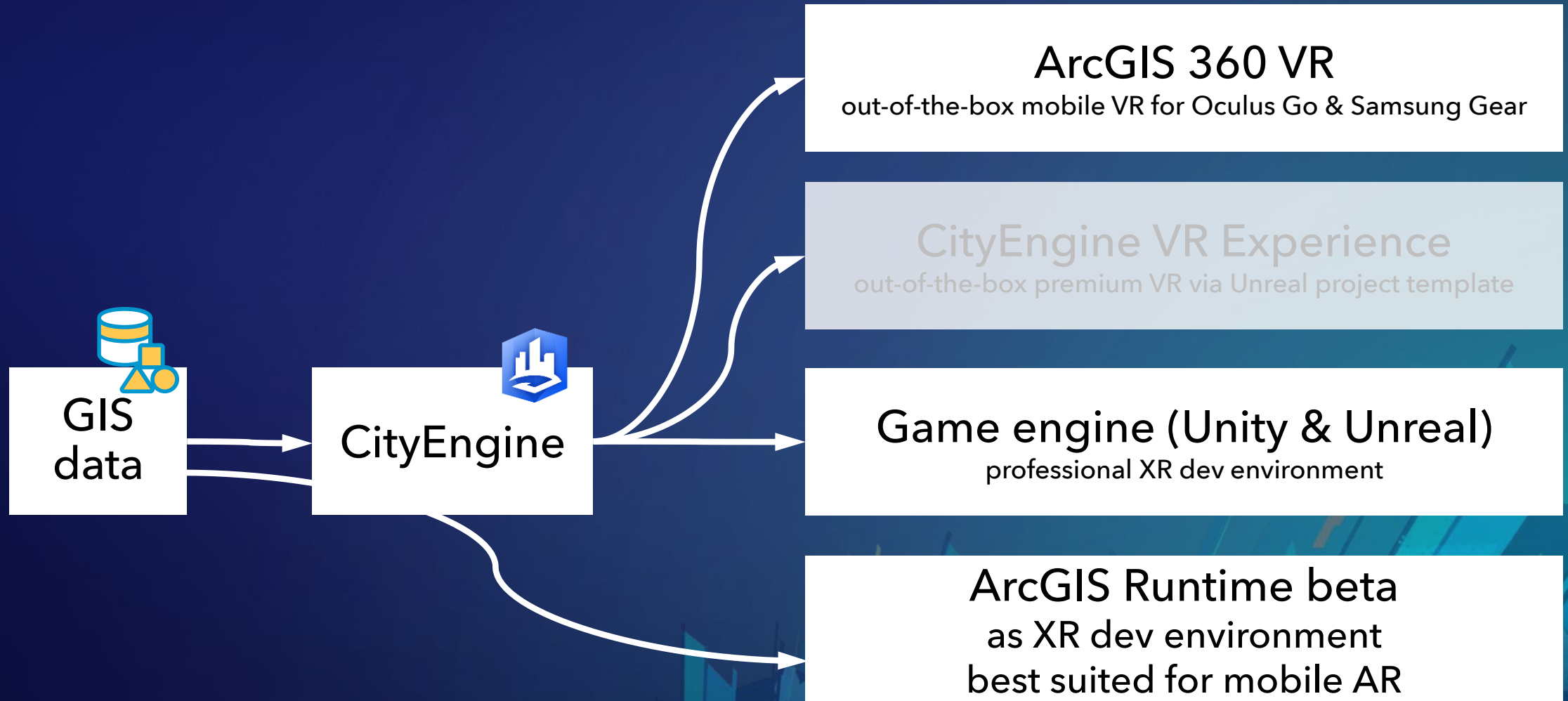
- Low price
- Broad reach
- Graphics limited
- Bandwidth limited
- Only 3 DoF still



- High cost
- Complex setup
- Great graphics
- Free movement
- Advanced controllers



Mobile VR



Premium VR with CityEngine

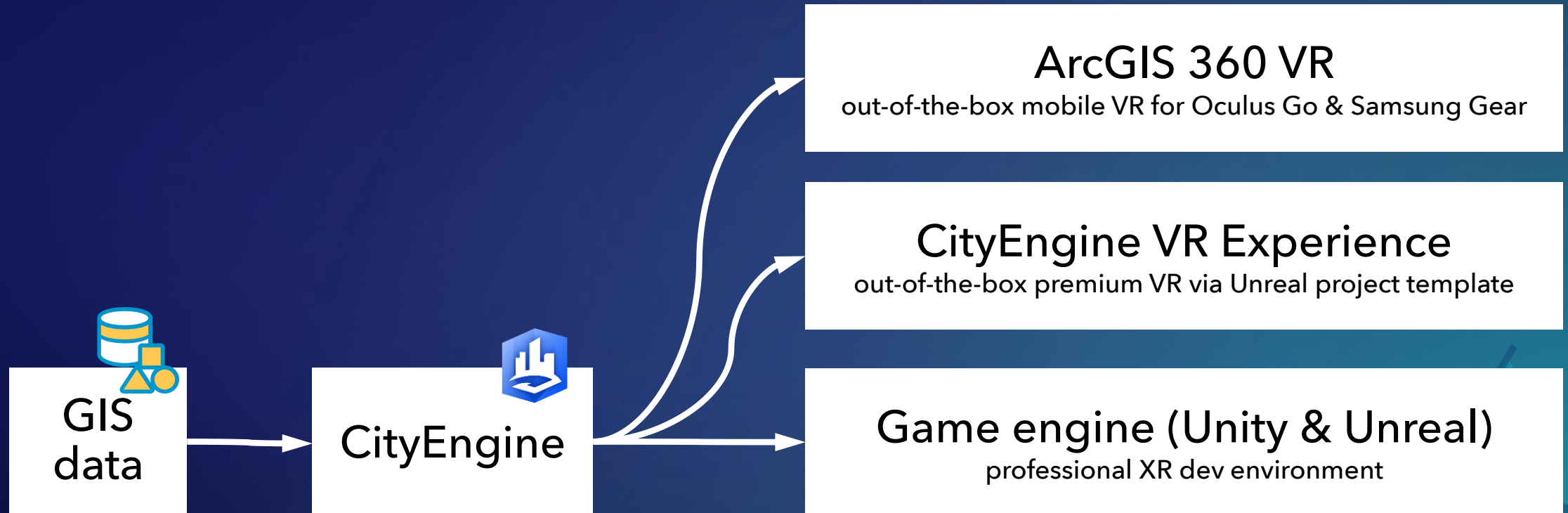
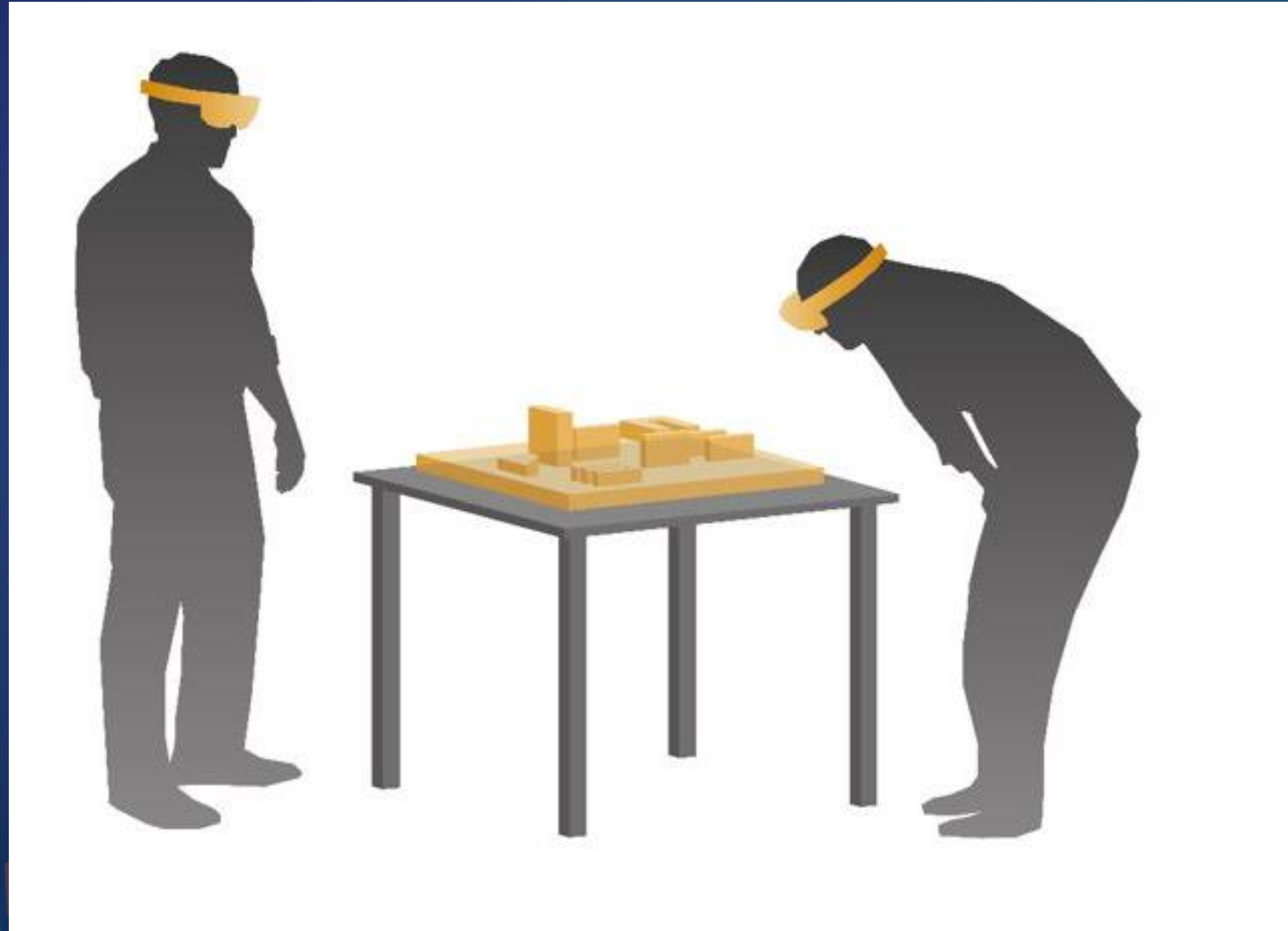


Table-scale a.k.a. the “Tabletop” UX

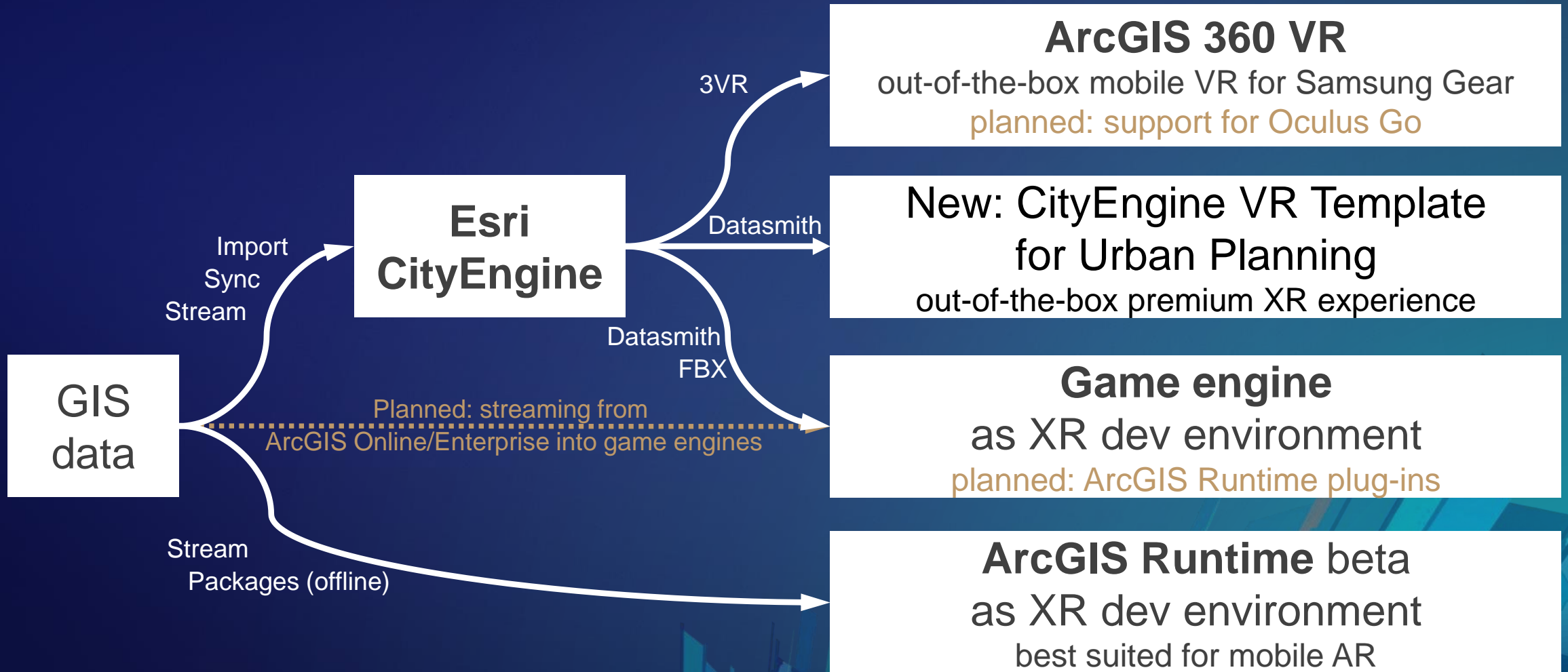
© 2017 City of Zurich

- Common UX pattern in MR, VR & AR
- Collaborative
- Intuitive, people relate to table
- No motion sickness





XR with ArcGIS



Mobile VR and AR

The background of the slide is a dark blue gradient. In the bottom right corner, there is an abstract graphic composed of various geometric shapes, including rectangles and lines, in shades of teal, light blue, and orange. These shapes are arranged in a way that suggests depth and movement, possibly representing a digital or architectural environment.



ArcGIS 360° VR

Experience 3D in first person

Share VR experiences via the web

Compare scenarios interactively



oculus Go

The easiest way
to experience VR.
No PC required.



Coming 2018



ArcGIS 360 VR Experience & 360 Viewer

- **A new Esri supported format: .3VR**
 - Composed of multiple rendered photospheres
 - Can store views from multiple locations
 - Can switch between locations using visual bookmarks in scene
 - Each location can store multiple states, such as design scenarios
 - Can switch between scenarios
- **How is it authored:** Created from CityEngine scenes, with plans in the future to support authoring from other applications, and consumption of spherical photography
- **How is it viewed:** In a VR application for Samsung Galaxy (eventually other devices). Additional support for viewing by a web app.

3VR Specification

```
{
  "views": [                                # list of views
    {
      "name": "State Street Park",
      "camera": {
        "position": [ 27.5,-105.0625,255.07031 ],
        "positionGlobal": [ -14680503.451115916,171302.8003556006,3268198.8452125844 ],
        "tilt": 57.601192,
        "heading": -43.801823
      },
      "content": [                            # list of scenarios (per view)
        {
          "scenarioRef": "./scenarios/0"      # ref to scenario ('orthogonal' to views)
          "dataRef": "./data/0",            # ref to panorama and its thumbnail
        }, ...
      ]
    }, ...
  ],
  "data": [                                  # list of panorama pics (stored in ./resources/)
    {
      "cube": {                              # encoding type is cube map
        "href": "./resources/State_Street_ParkScenario_1.jpg",
        "thumbnail": "./resources/State_Street_ParkScenario_1_preview.jpg",
      }
    }, ...
  ],
  "scenarios": [                             # list with info on scenarios
    {
      "name": "Scenario 1",
      ...
    }, ...
  ],
  "scene": {                                # coordinate system info etc
    "crsGlobal": "EPSG:3857",
    "crsLocal": "EPSG:2229",
    ...
  }
}
```



Creation and Consumption

Authoring

generate JPG panoramas with index.JSON & upload as .3VR



CityEngine
+ other tools later



360 VR Experience
on ArcGIS Online/Portal

Consumption

download index.JSON & request/cache JPG panoramas



ArcGIS 360 VR
x-platform viewer app

Graphics
not yet done

Esri Labs ArcGIS 360 VR

Esri Labs is proud to present ArcGIS 360 VR. The ArcGIS 360 VR app allows you to quickly immerse yourself into 3D city models by teleporting to static viewpoints and comparing different urban design scenarios. These VR experiences can be easily created with the 3D modeling software, [CityEngine](#), and are hosted on ArcGIS Online, the cloud platform of the global smart mapping leader, Esri. Rather than relying on high-performance graphics computers and cumbersome wired VR accessories, a simple smartphone paired with an affordable wireless headset are all that is required to be immersed in a ArcGIS 360 VR experience.

"By using ArcGIS 360 VR, our planning board and jurors can now study the impact of new architectural developments and urban planning scenarios from the perspective of pedestrians and citizens." Christian Huerzeler, project manager at the Department of Urban Planning in Zurich.

The app is available for the Samsung Gear VR headset on the Oculus platform. Join this Esri Labs project and we will send you a promo code to access the app.

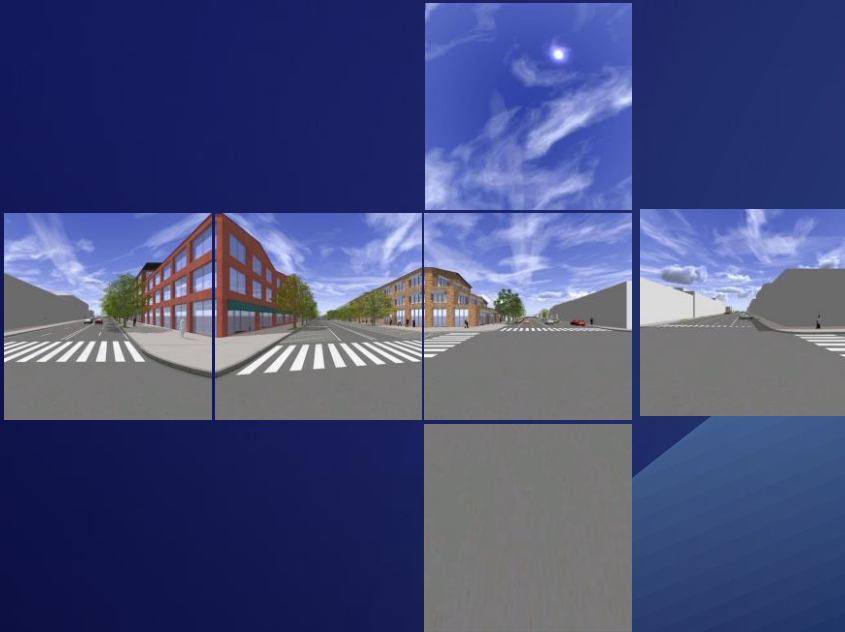
Requirements

Samsung Gear VR headset

[Join this Esri Labs project](#)



What's coming next



Improvements

- Hand controller support
- View to view customization

Near-term

- Support for Oculus Go
- Publishing 360 imagery from CE

Mid-term

- Web-based app for AGO
- Animation and video support

Search for layers, objects or attributes

- Terrain
- Buildings [1485 objects]
- Railroads [3756 objects]
- Network
- Blocks
- Esri Office Building [51 layers]
- Building [1 layer | 1 object]

Navigator

- ESRI.lib
- Example_Esri_Zurich_Office_Preview
 - assets
 - data
 - images
 - maps
 - models
 - rules
 - scenes
 - Esri_Zurich_Office_3VR.cej
 - Esri_Zurich_Office_4KML.cej
 - Esri_Zurich_Office_4WebScene.c...
 - Esri_Zurich_Office_Alone.cej
 - Esri_Zurich_Office_cbre.cej
 - Esri_Zurich_Office_EWV1.cej
 - Esri_Zurich_Office_FeetAtZero.cej
 - Esri_Zurich_Office_StatePlane.cej
 - Esri_Zurich_Office.cej
 - scripts
- Example_Philadelphia_2017_0
- Example_Redlands_Redevelopment_...

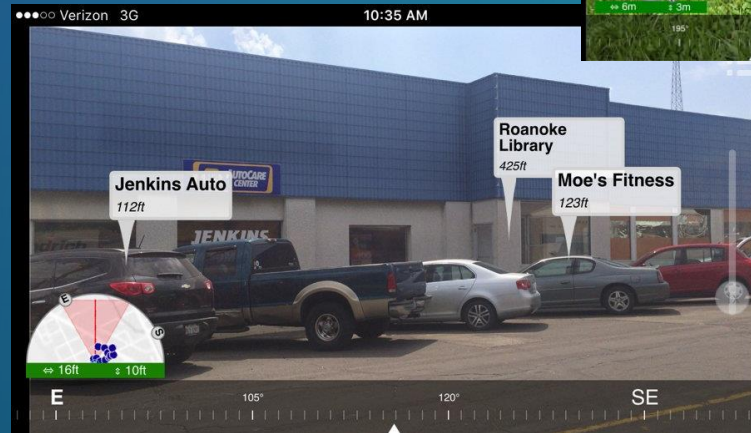


Inspector

Grid Size 10m | CH1903 LV03 | 999098 Polygons

AuGeo

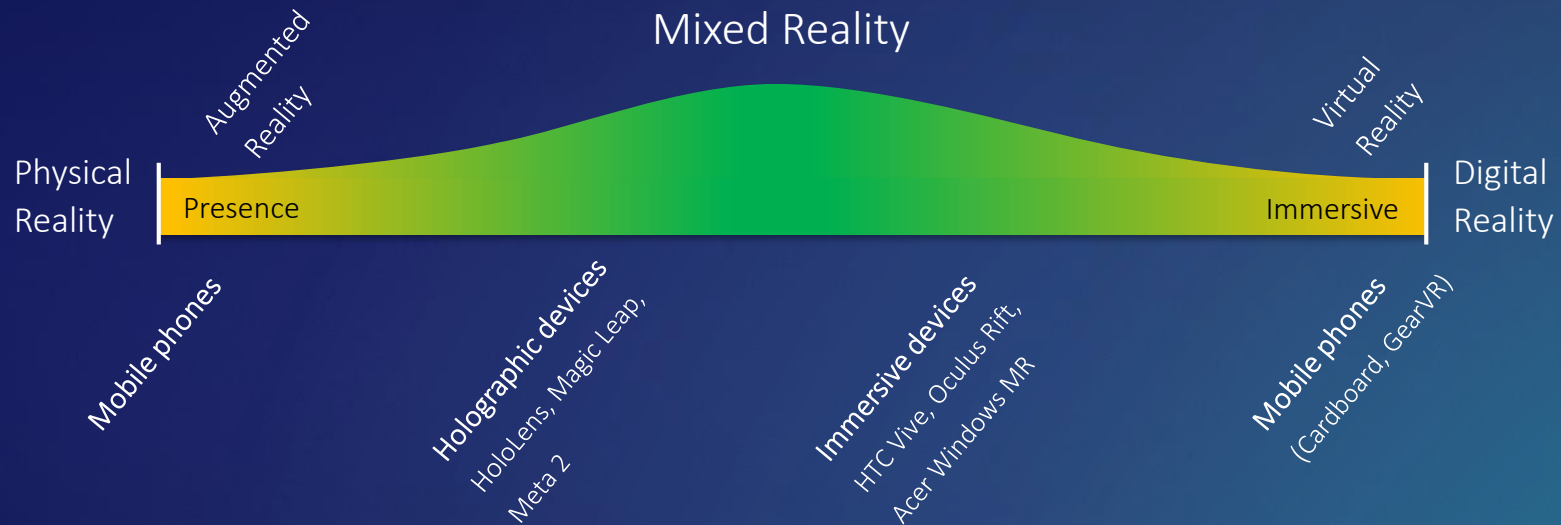
- A mobile app to display your GIS features in an Augmented Reality environment.
- Completely out of the box. Easy to setup.
- Available for iOS and Android
- By Esri Labs
- Source code available with [AppStudio for ArcGIS](#), [tutorial available on YouTube](#)



AR with ArcGIS Runtime

The background of the slide is a dark blue gradient. In the bottom right corner, there is an abstract graphic composed of various geometric shapes, including rectangles and lines, in shades of blue, green, and orange, creating a sense of depth and movement.

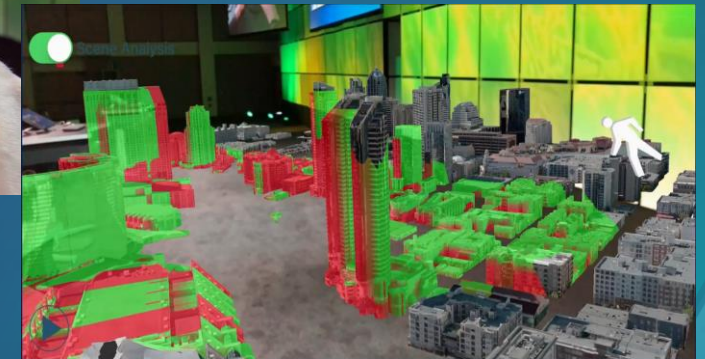
Targeting Mixed Reality experiences



- Developers want to use their live and local authoritative GIS content and analytics across the mixed reality spectrum
- Critical needs for usability
 - Virtual reality needs high fidelity and responsive performance
 - Augmented reality needs positional accuracy

Supporting Mixed Reality with ArcGIS Runtime today

- Enhance existing ArcGIS Runtime SDKs
 - Integrated with the ArcGIS Platform
 - 3D already supported on all platforms/devices
 - Native apps able to access sensors/controllers
- **Private beta program!**
 - SDKs for .NET, iOS, Android
 - Targets mobile devices

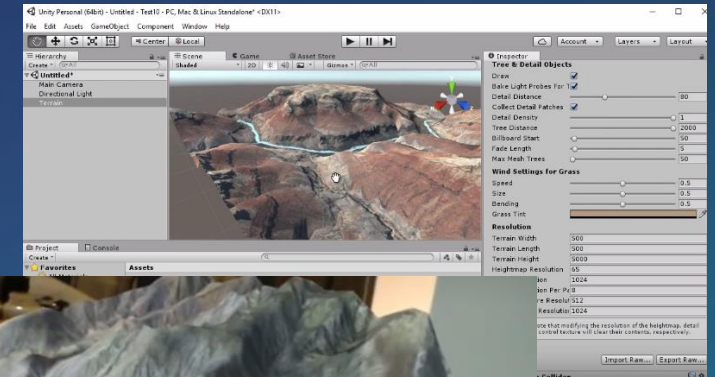


Request access to the beta program, email:

ArcGISRuntimeARVRBeta@esri.com

Supporting Mixed Reality with ArcGIS Runtime in the future

- Integrate with game engines
 - New light-weight Runtime API – no rendering engine
 - Good for MR but also any “gaming type” application that needs GIS
 - Easy cross hardware development
 - Good MR UI design experience
 - Integration with the existing MR community
 - Physics and other 3D effects





ArcGIS Runtime AR demo

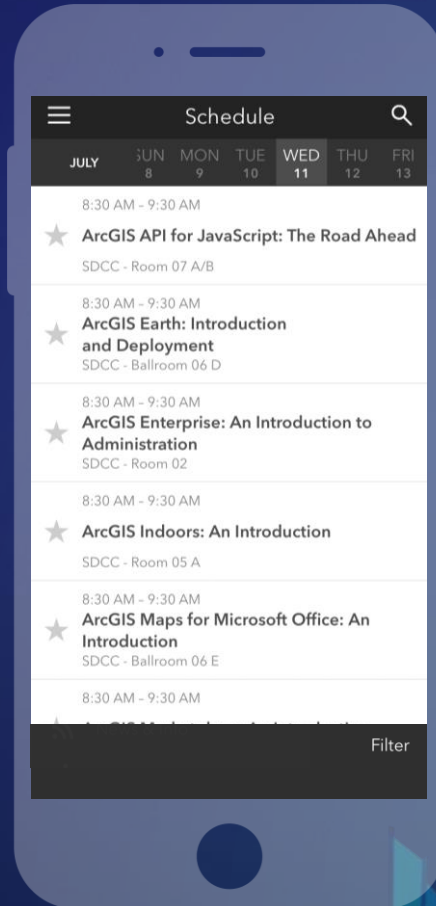
Adrien Meriaux

Please Take Our Survey on the App

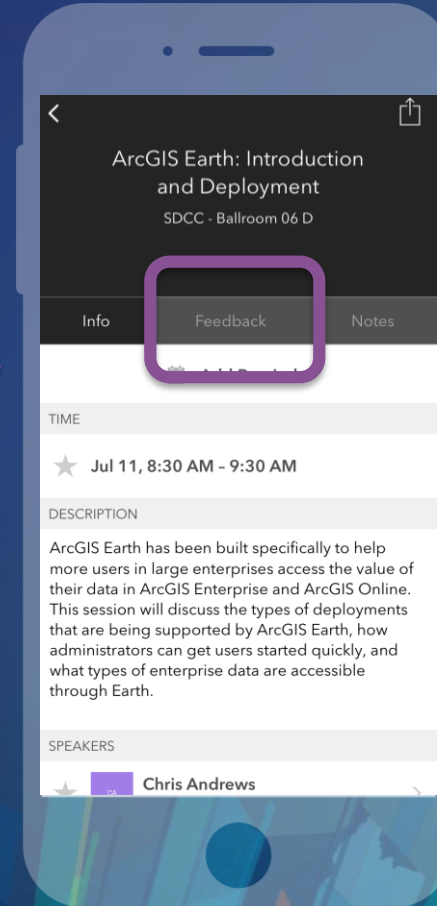
Download the Esri Events app and find your event



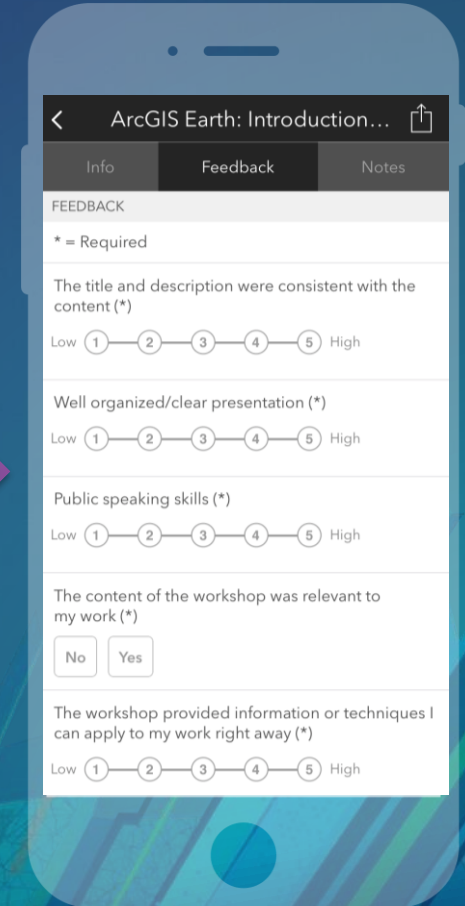
Select the session you attended



Scroll down to find the feedback section



Complete answers and select "Submit"



Get in touch...

LinkedIn:

www.linkedin.com/in/taishawaeny

Email:

ameriaux@esri.com

ewittner@esri.com

rhanson@esri.com

twaeny@esri.com