VR and AR in ArcGIS: An Introduction

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SEE
WHAT
OTHERS
CAN'T

Agenda

- Product Overview and Terminology - Taisha
- Mobile VR - Eric
- AR with ArcGIS Runtime – Rex

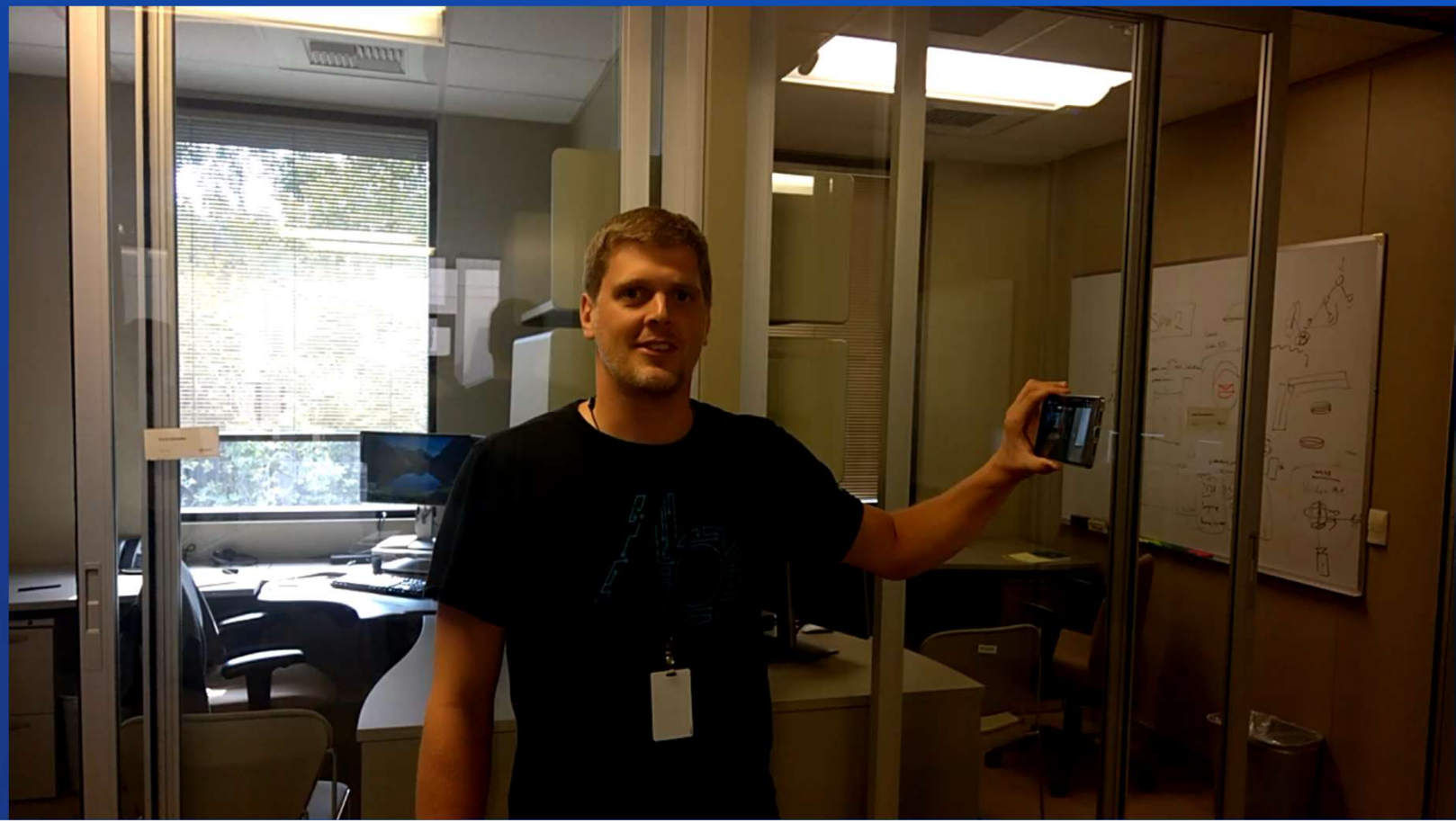
Overview

VR - Virtual Reality

Being there

AR - Augmented Reality

Interacting with outside world

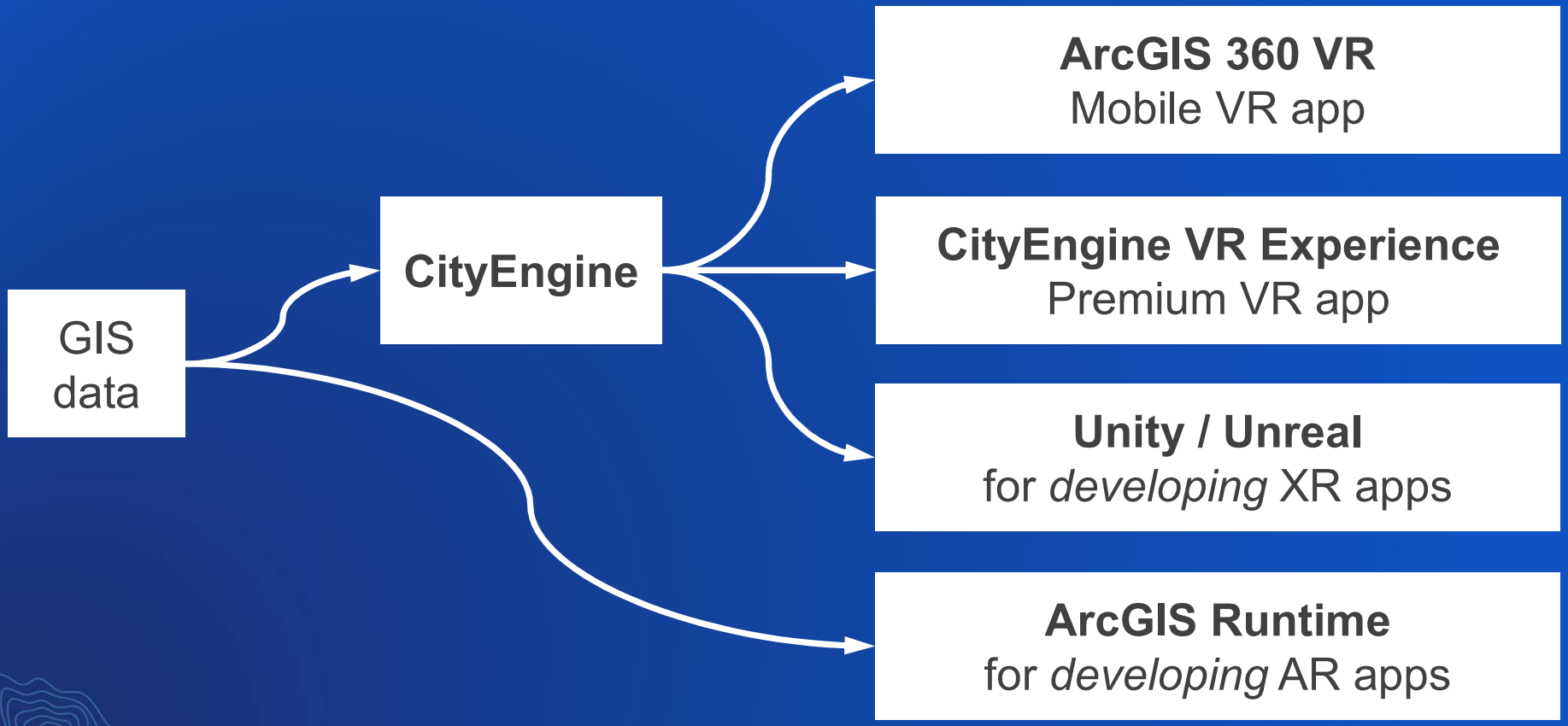


MR - Mixed Reality

Mixed presence

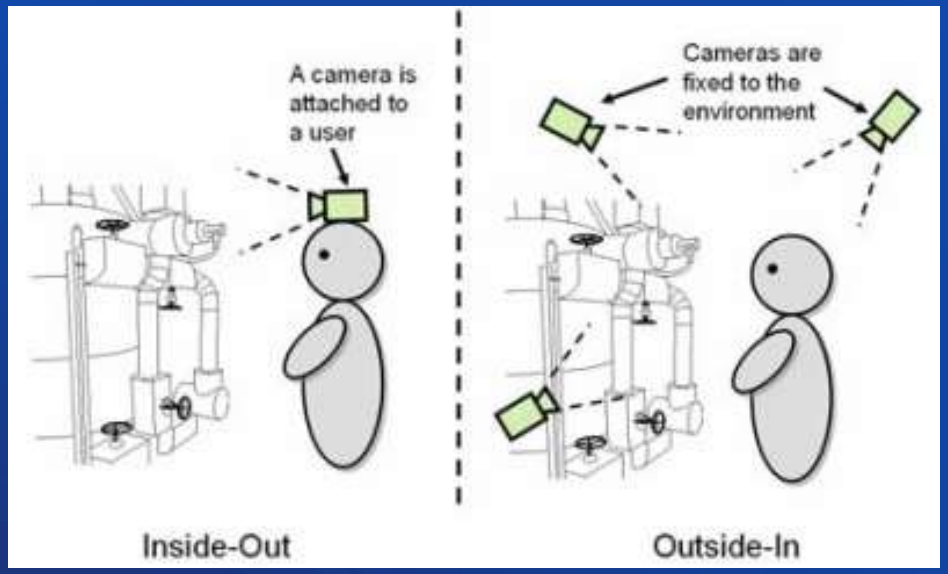
Microsoft HoloLens & Magic Leap

XR with ArcGIS



Positional Tracking for XR

Outside-in / Inside-out



Inside-out: Cameras on HMD, marker-less tracking of position changes in relation to environment

Outside-in: Cameras placed in stationary locations & markers on devices (HMD & controllers)

Outside In (complicated setup)

Oculus Rift, HTC Vive,…

…the beginnings…

Inside Out

Oculus Rift S,…

Premium VR

- Great graphics but cables
- High cost

Hololens, Oculus Quest,…

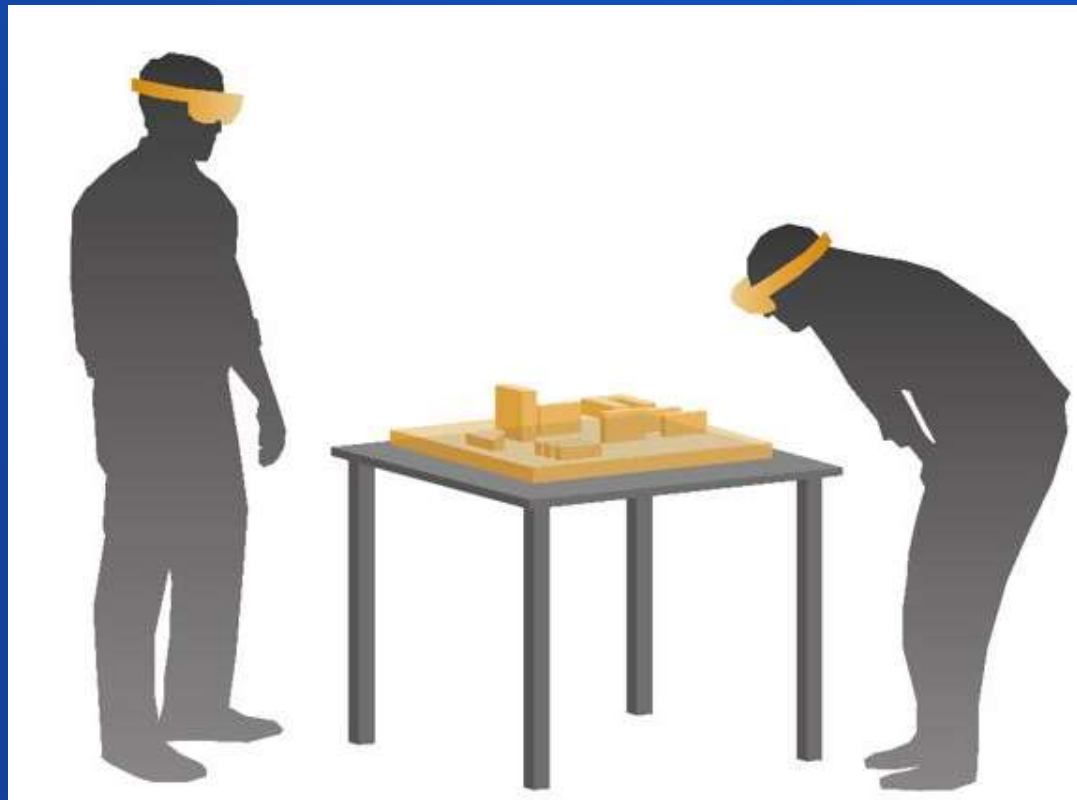
Mobile VR

- Limited graphics
- Low cost

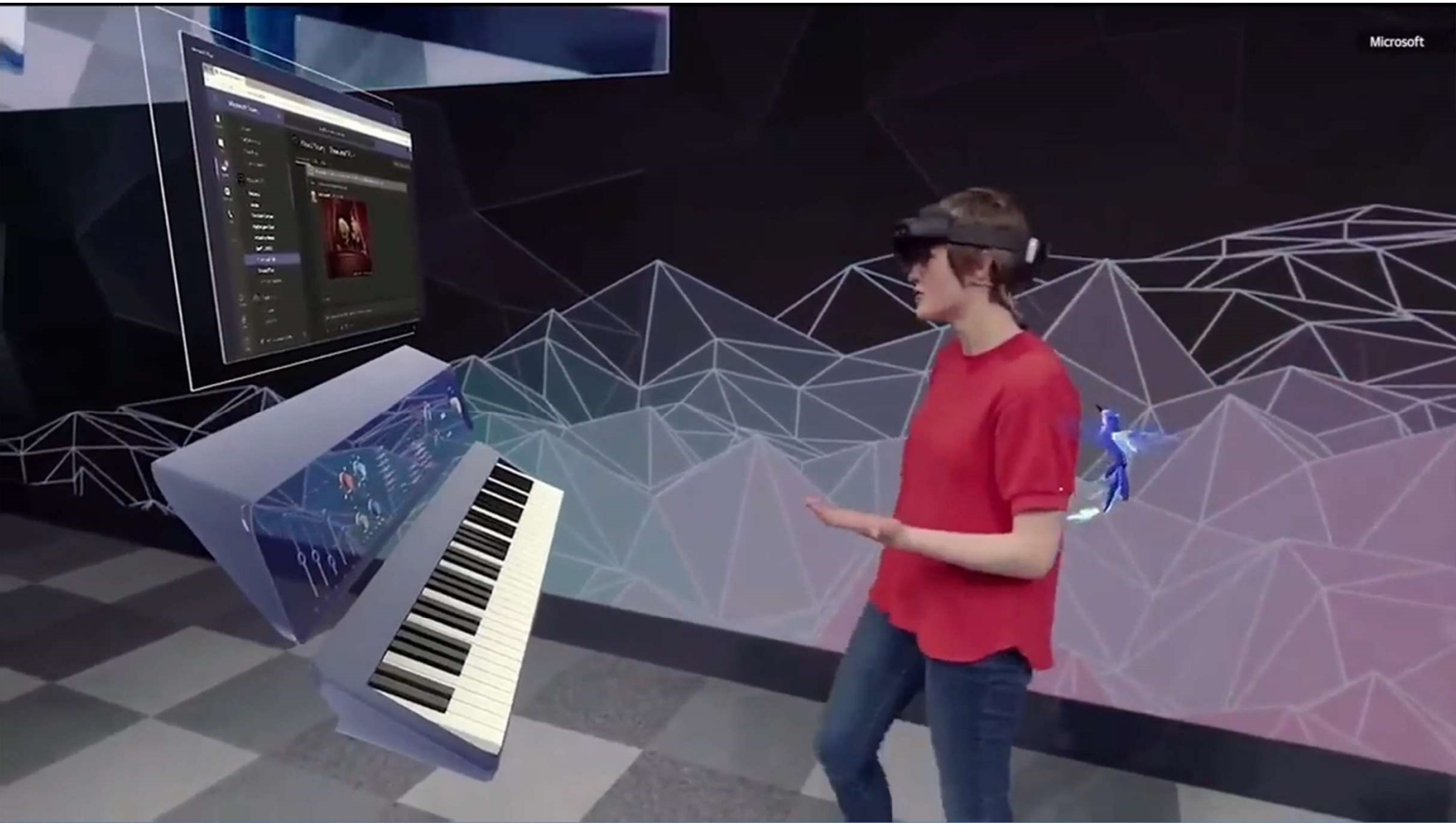
XR User Interfaces

Table-scale a.k.a. the “Tabletop” UX

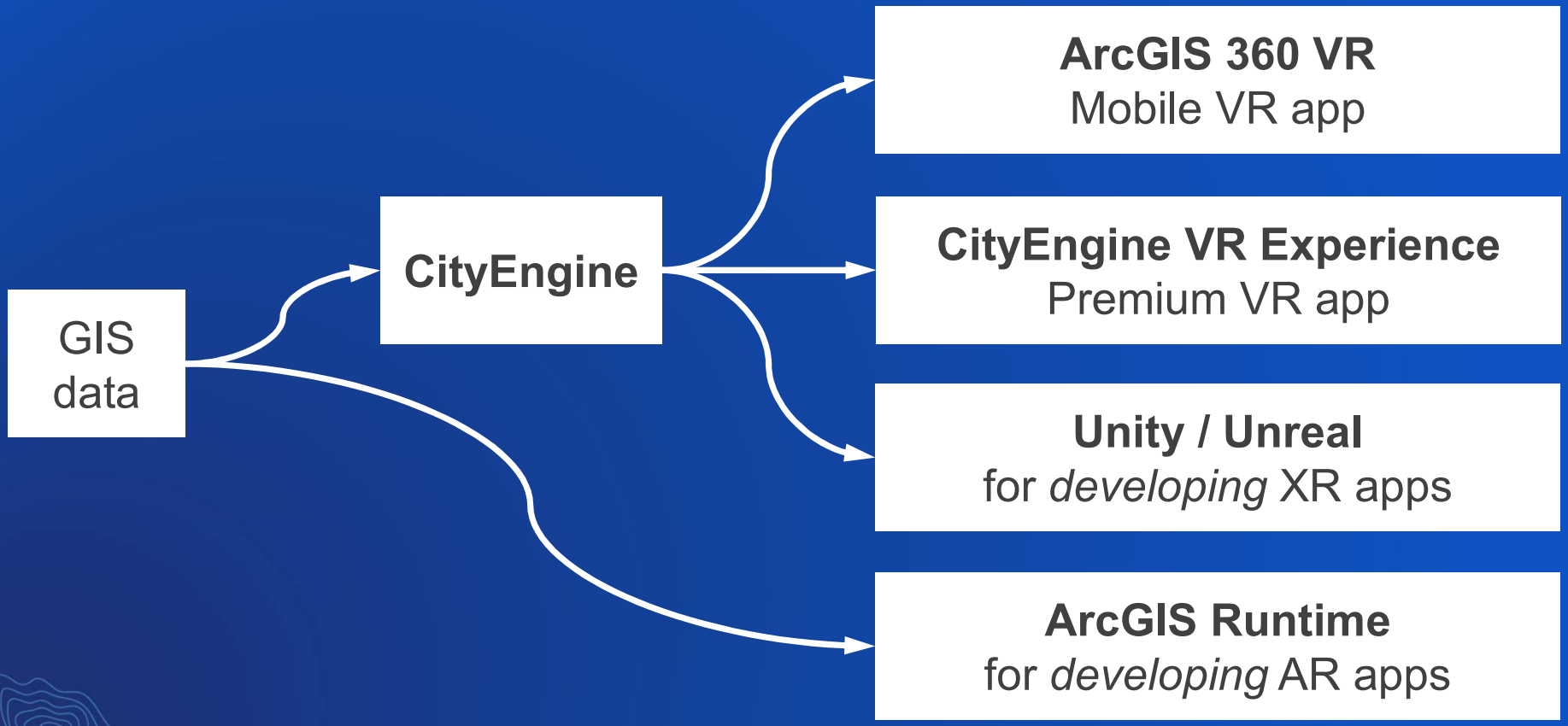
- Common UX pattern in MR, VR & AR
- Collaborative
- Intuitive, people relate to table
- No motion sickness




Microsoft


Microsoft

XR with ArcGIS



ArcGIS 360° VR

Mobile Focused VR Experience

ArcGIS 360° VR

"Immersion made easy."

"Putting the world in perspective,
past, present, and future
quickly and easily."

(Currently an Esri Labs project)

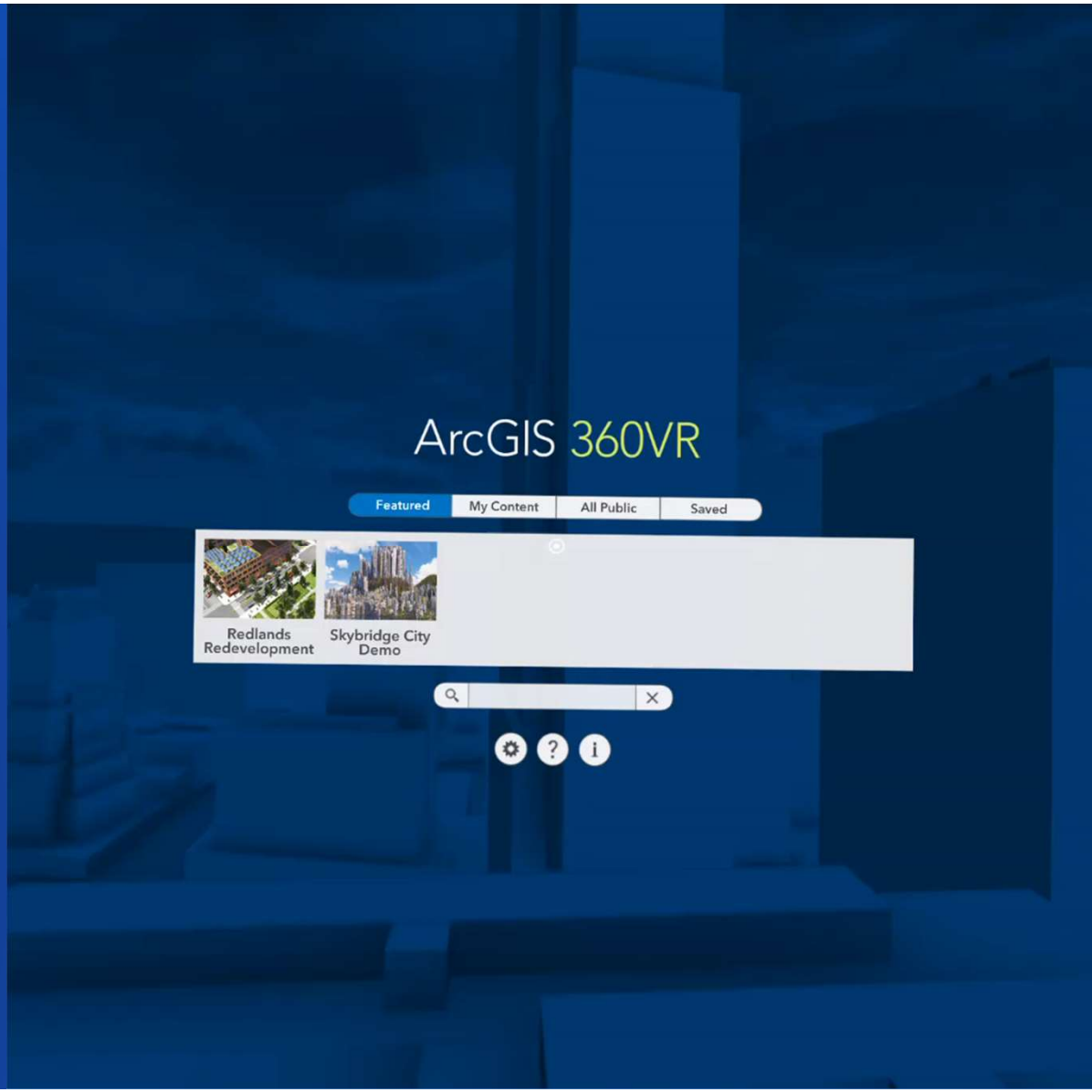
Use Cases

Simple creation of mobile VR demos for the public

To showcase urban redevelopments to the public, CityEngine users like the City of Zurich are looking for a simple CE-scene-to-VR solution that is easy to use (= one-click publish) and easy to setup (= *mobile* VR that does not require high-end PC). Planned to be used on trade shows / booths, public show rooms / installation, and architectural competition viewing events.

Quick immersion into design to experience view impact

CityEngine users interested in VR would like to quickly immerse into their 3D scenes to review the design. However they want a simple, iterate-able workflow and not a complicated 3D data pipeline to Unity. Also they want to share the VR experience (mainly for review by peers, not yet by the public). The typical design question that VR can answer better than every other visualization: "*How does the new neighboring building impact the view from the balcony?".*



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 and Oculus Go (eventually other devices). Additional support for viewing by a web app.

Creation and Consumption

Authoring

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

Consumption

download index.JSON & request/cache JPG panoramas

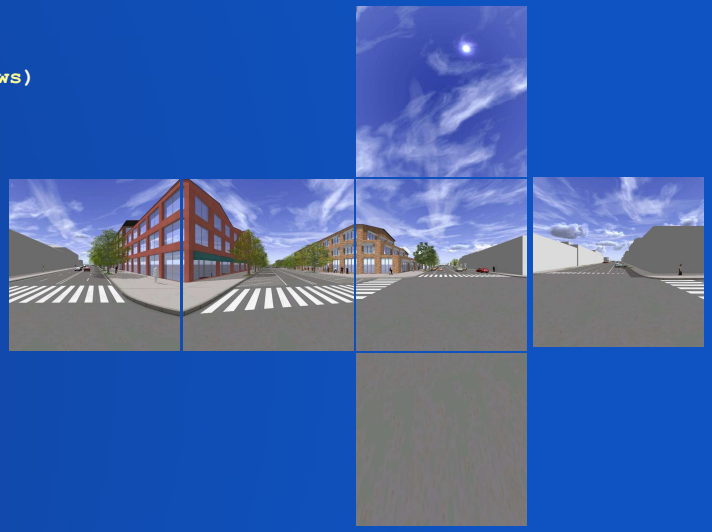
CityEngine
+ other tools later

360 VR Experience
on ArcGIS Online/Portal

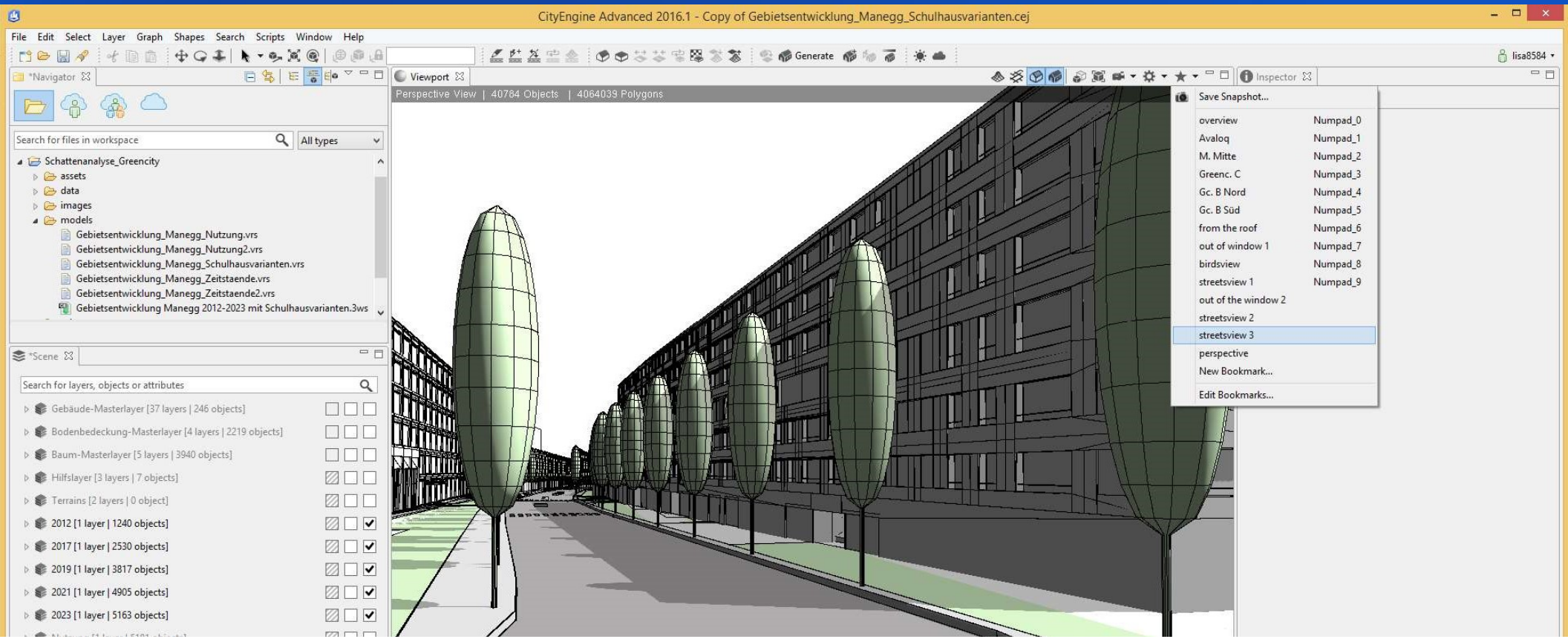
ArcGIS 360 VR
x-platform viewer app

3VR Specification

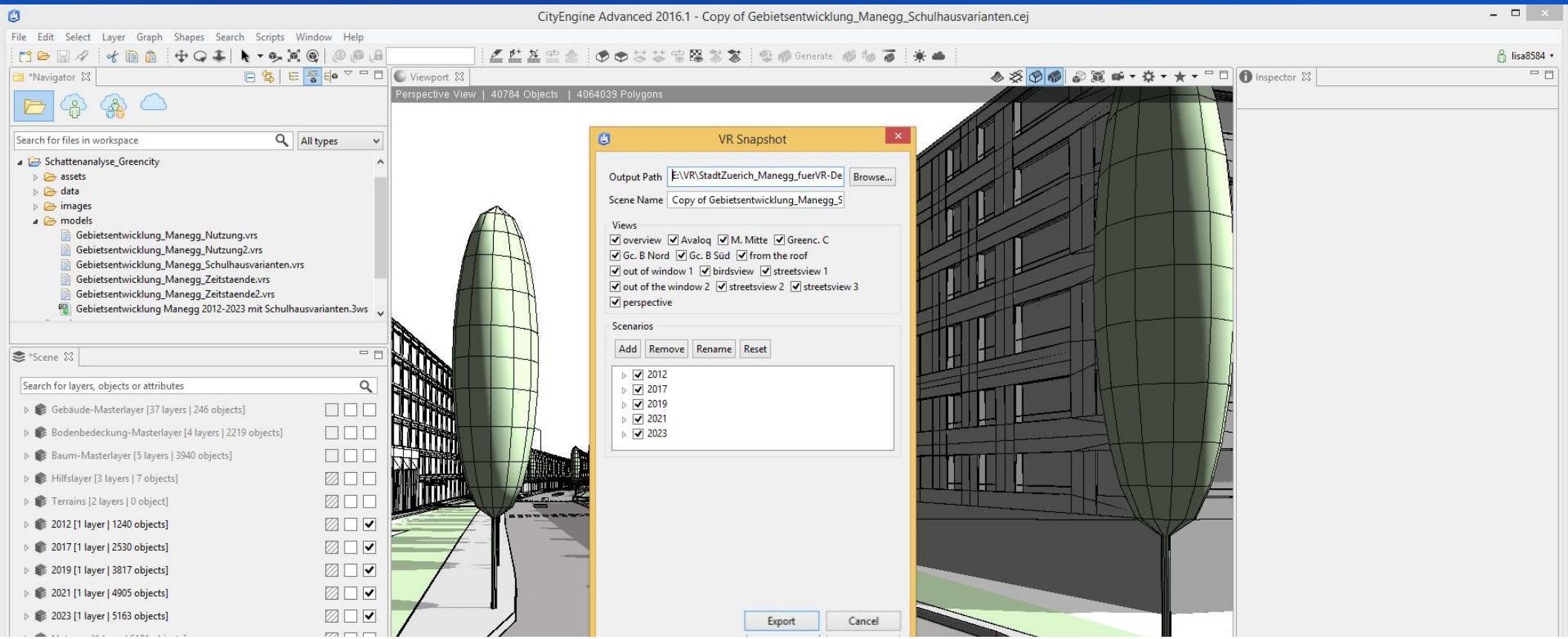
```
{
    "views": [                              # list of views
        {
            "name": "State Street Park",
            "camera": {
                "position": [ 27.5,-105.0625,255.07031 ],
                "positionGlobal": [ -14680503.451115916,171302.8003556006,3268198.8452125844 ],
                "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",
        ...
    }
}
```



Step 1: Set the viewpoints in a 3D scene



Step 2: One-click creation of .3VR item



Early Adopter Community

esri

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.

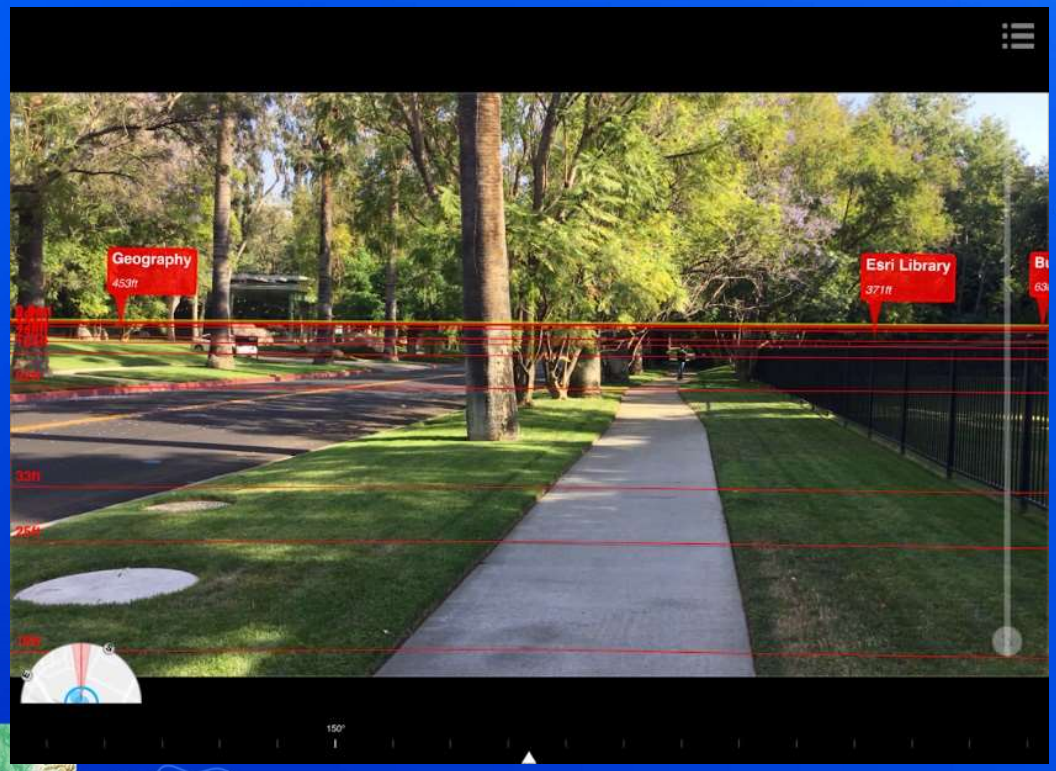
The app is available for the Samsung Gear VR headset on the Oculus platform. Join this Esri Labs project and we will send you a promo code to access the app.

Requirements
Samsung Gear VR headset

Join this Esri Labs project

ArcGIS 360 VR: Status

- In “maintenance” mode
  - 360VR 2019.0 released
    - Minor bug fixes
    - Oculus go support
  - Additional minor fixes coming in City Engine 2019.0
- No change regarding Oculus store issues (not public, key only)
- Keeping an eye on WebXR performance issues

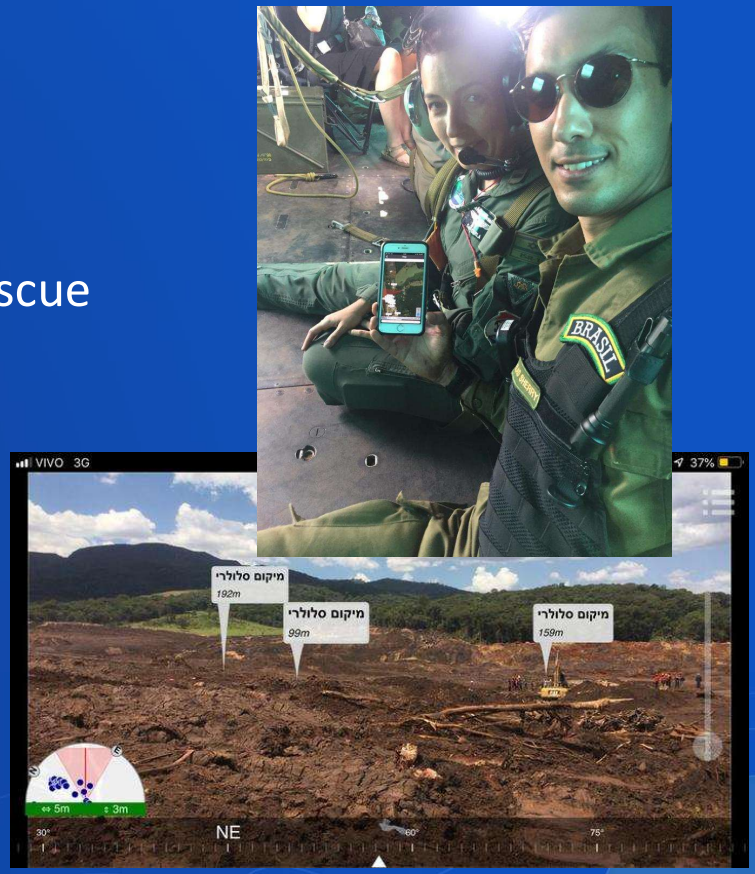


App: AuGeo

Esri Labs AR Exploration

AuGeo: Status

- In “maintenance” mode
  - User feedback from Brumandinho Dam Search and Rescue operations
- Next generation of Augeo
  - Based on a research project “AR Story Map”
  - Build on top of the ArcGIS Runtime (iOS)



XR and ArcGIS Runtime

(for developers)

Rex Hansen

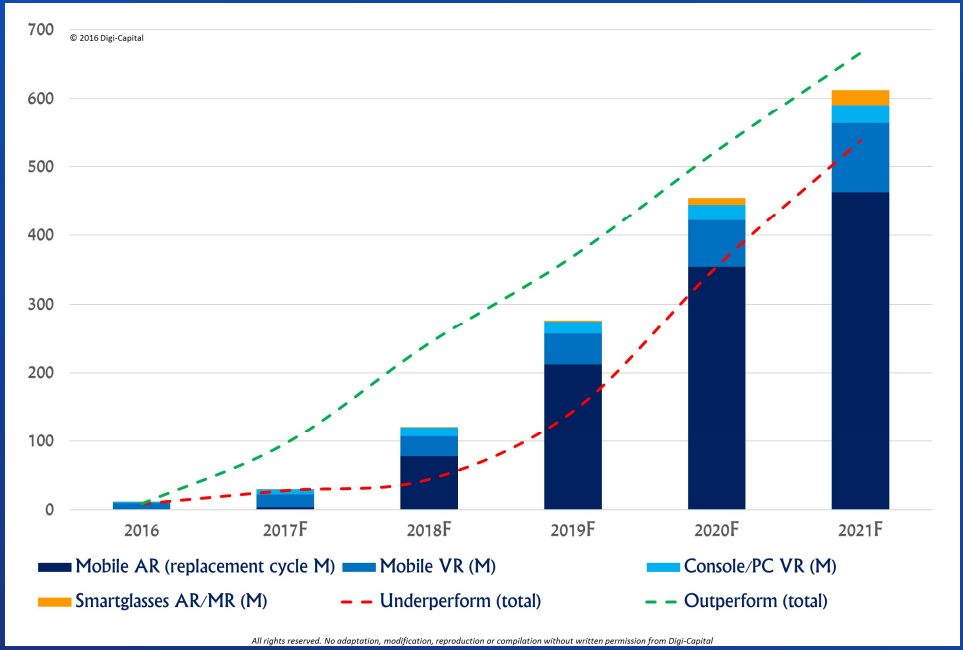
SEE
WHAT
OTHERS
CAN'T

Targeting XR experiences

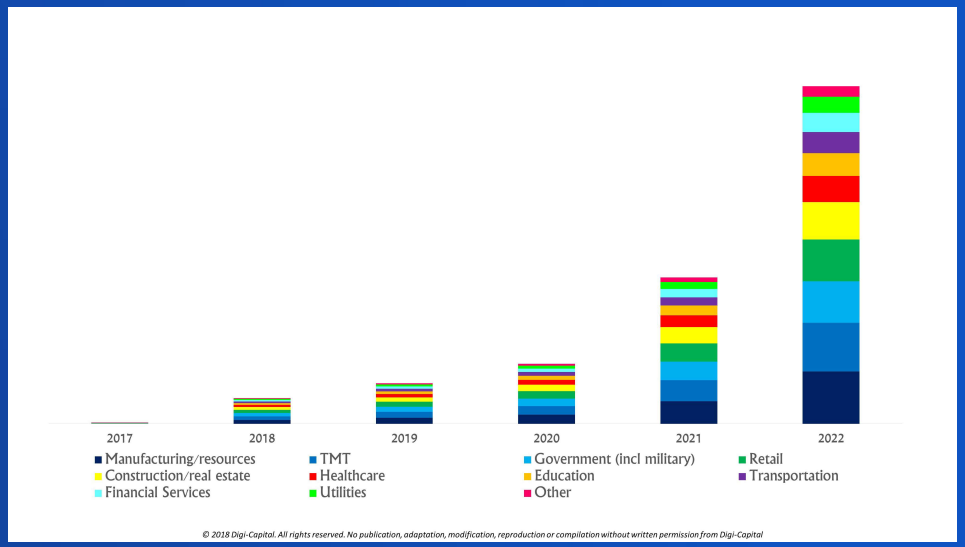
- Many organizations seek to use their live and local authoritative spatial content and analytics across the XR spectrum
- Critical needs for usability
  - Virtual reality needs high fidelity and responsive performance
  - Augmented reality needs positional accuracy
  - Must be cost effective

AR/VR Market Trends

Revenue by year and platform



Enterprise use of AR by industry



* Statistics from Digi-Capital

XR Market Trends in GIS

AR/MR

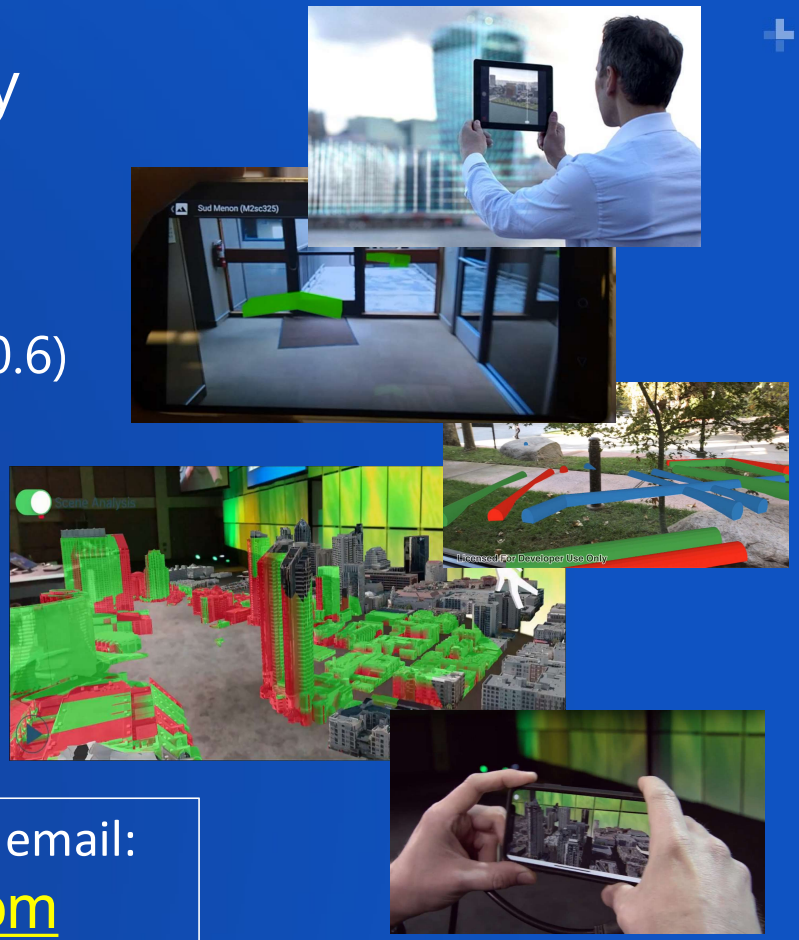
- Field operations, resource management, planning
  - Handheld
    - Use existing mobile devices
    - Simple enhancements to existing workflows
  - Head-mounted
    - In the field, full scale; In the office, table top
    - Hands-free for rapid response
    - Most immersive, collaborative 3D experience possible

VR

- Education, planning, training
  - Mobile
    - Easy, cheap to distribute
  - Desktop
    - Cheaper than travelling to a site
    - Best VR experience possible

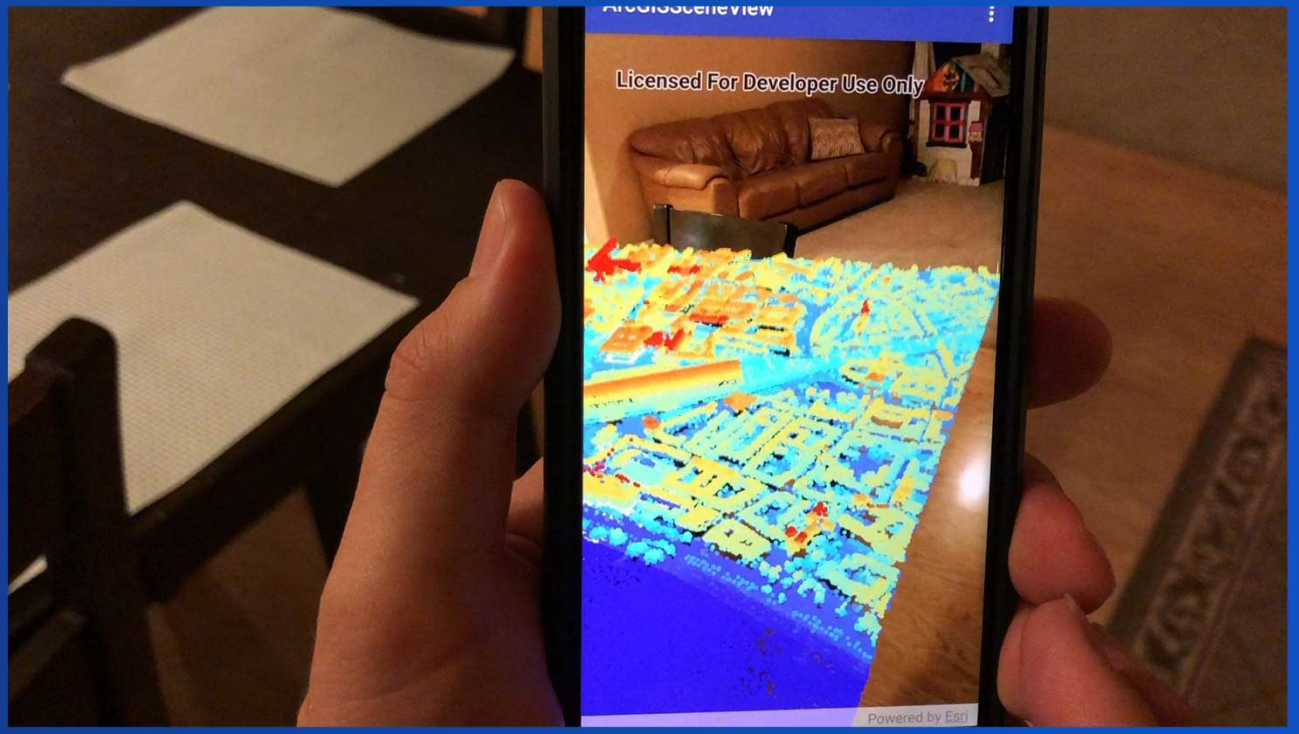
AR and VR with ArcGIS Runtime today

- Enhance existing ArcGIS Runtime SDKs
- Currently in Beta
- Available for production use with Update 6 (100.6)
  - Augmented reality for mobile platforms only
  - Available in Toolkits for .NET, iOS, Android, Qt
  - Not for VR or MR

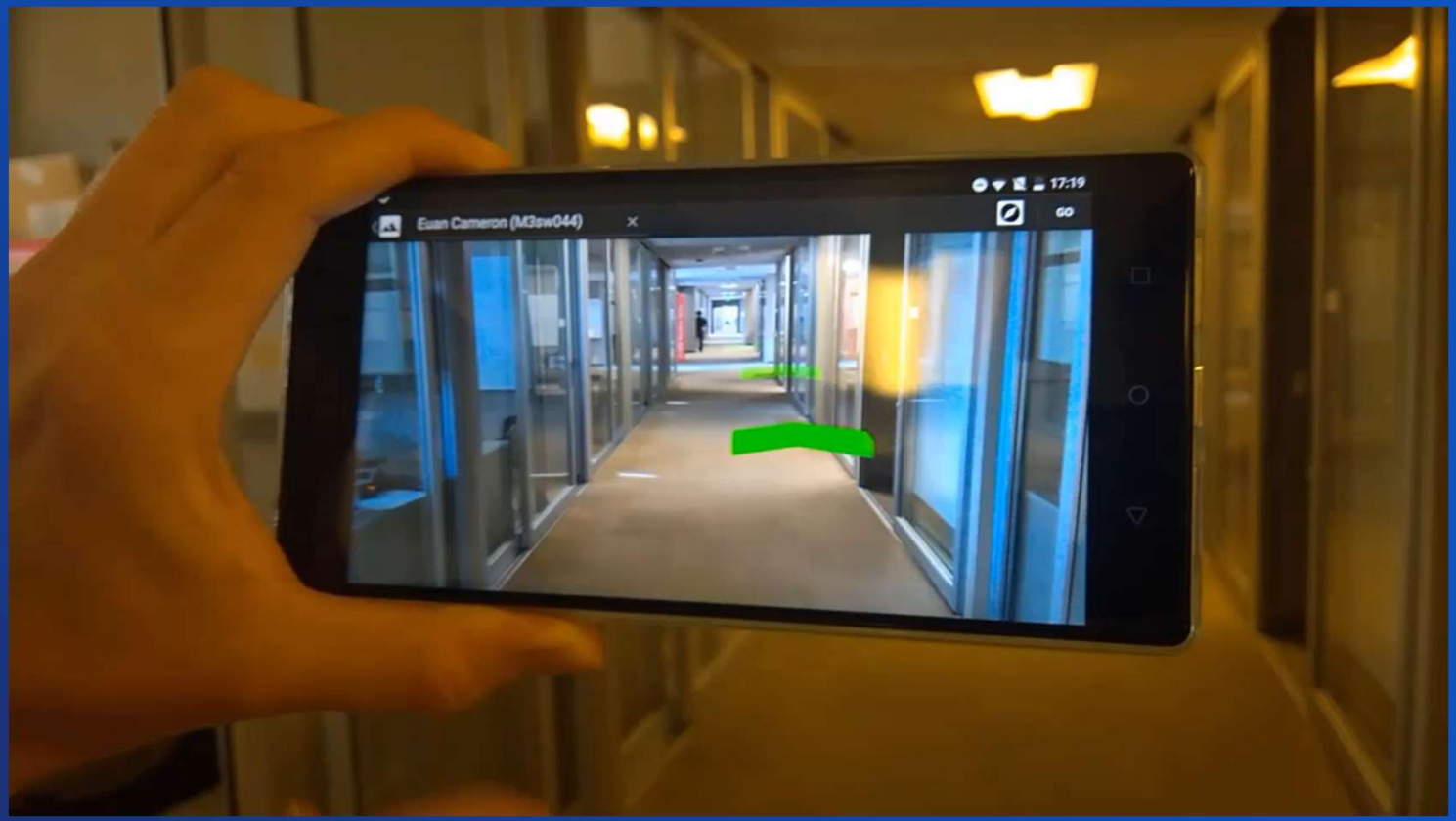


Get started, request access to the beta program, email:
ArcGISRuntimeARVRBeta@esri.com

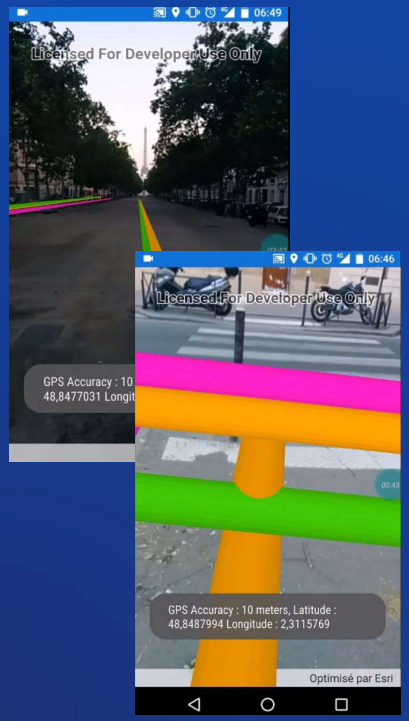
AR table-top data exploration

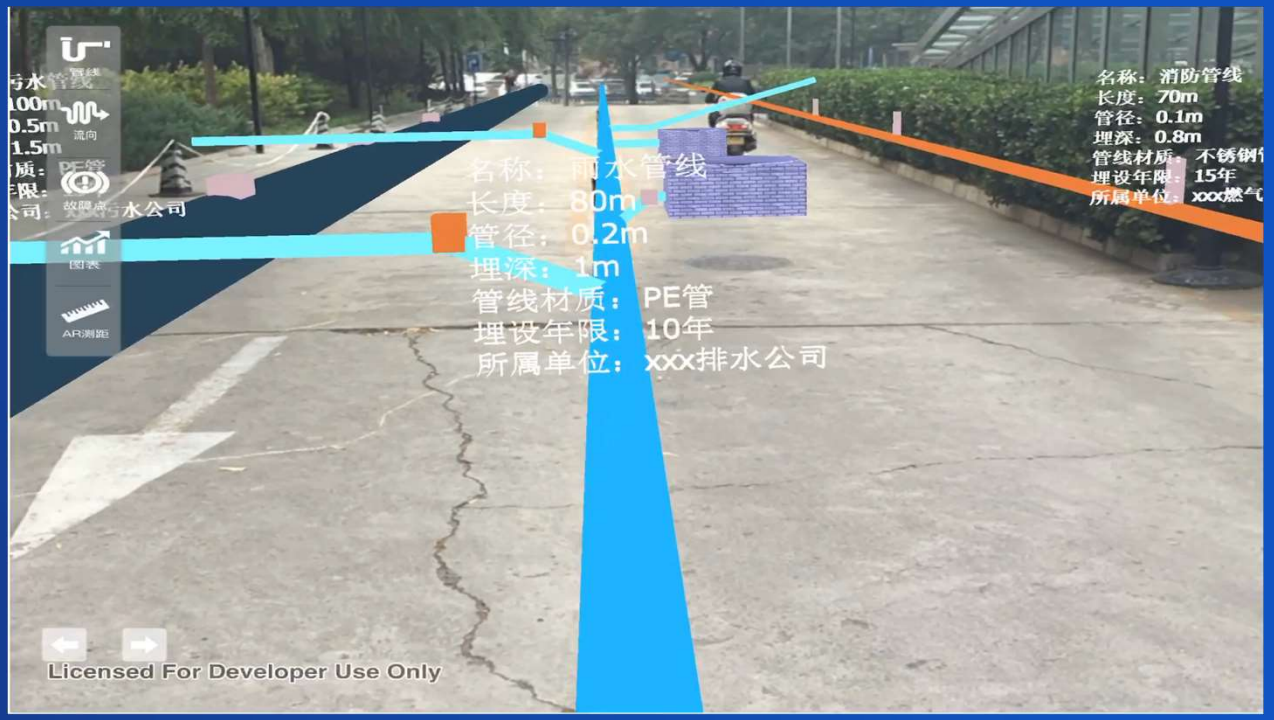


AR navigation



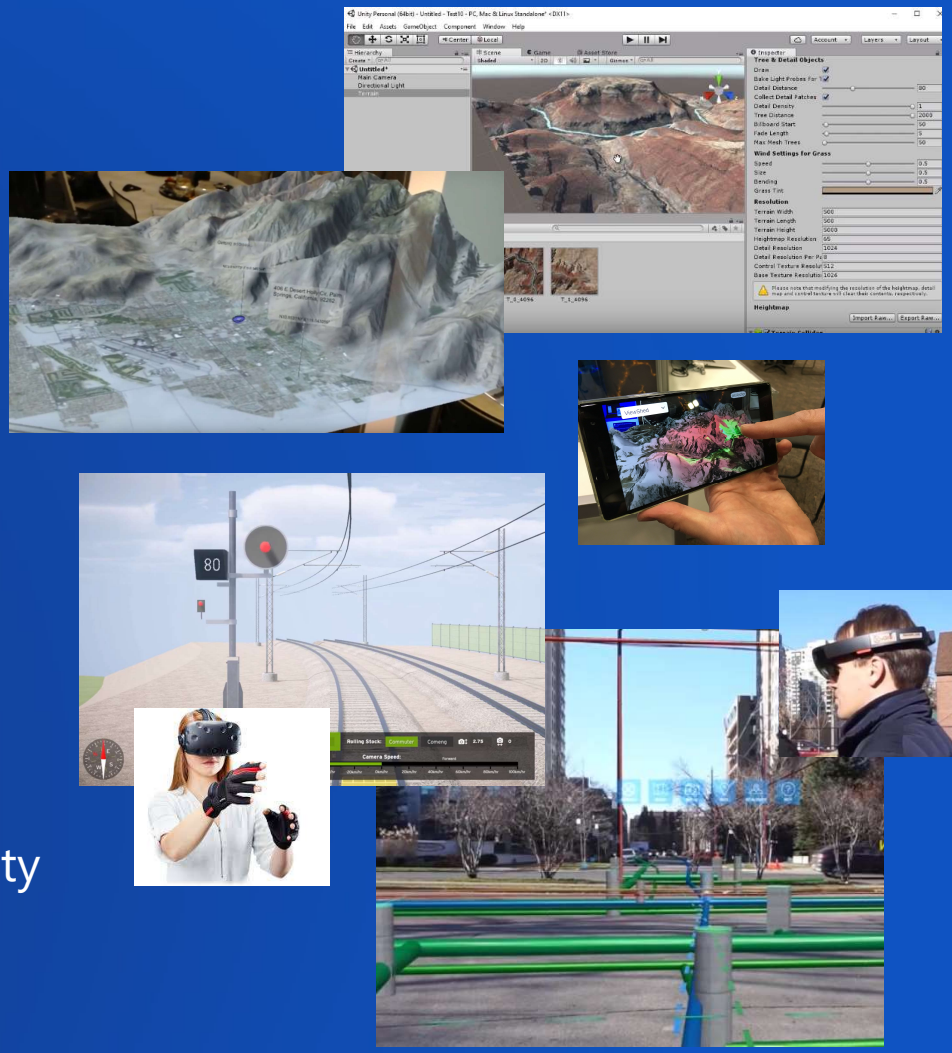
AR field operations





Integration with Game Engines

- All XR experiences
  - Also good for any “gaming type” app that needs GIS
- Lightweight API to integrate with Unity and Unreal Engine
  - Online and local data
  - Tiles, features, i3s
- Game engines offer
  - Easy cross hardware development
  - UI design experience
  - Integration with the existing community
  - Physics, animation, other effects



Get in touch…

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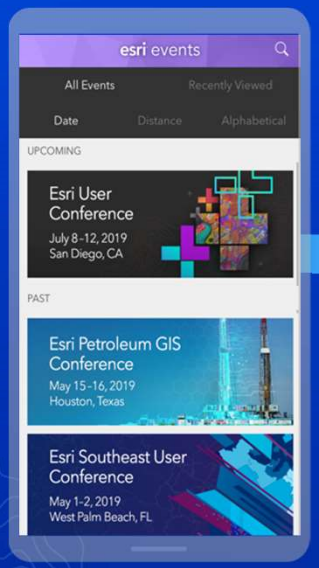
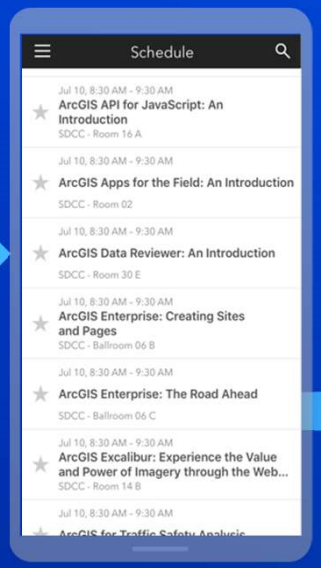
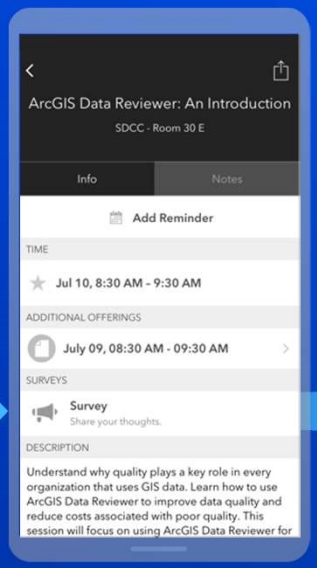


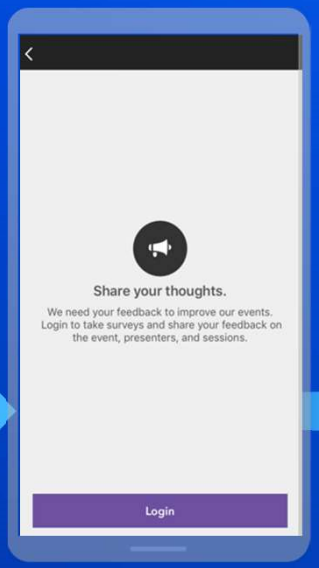
Select the session you attended



Scroll down to "Survey"



Log in to access the survey



Complete the survey and select "Submit"