Copyright © 2021 Esri. All rights reserved.

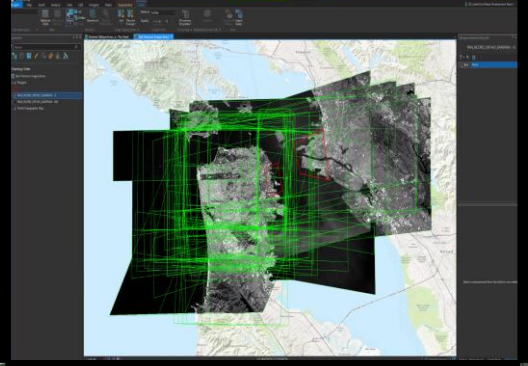
3D Across ArcGIS

Philip Mielke: 3D Web Experience Product Manager

Stephen Heidelberg: 3D Core Technology Product Manager

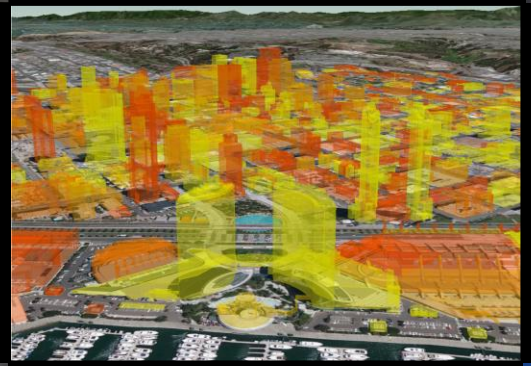
Safe Harbor Statement: This presentation includes forward-looking roadmap and schedule information that may include dates, release numbers, or scope that could change without notice. Customers and partners are advised not to make business or purchasing decisions based on such forward-looking statements.

Lidar



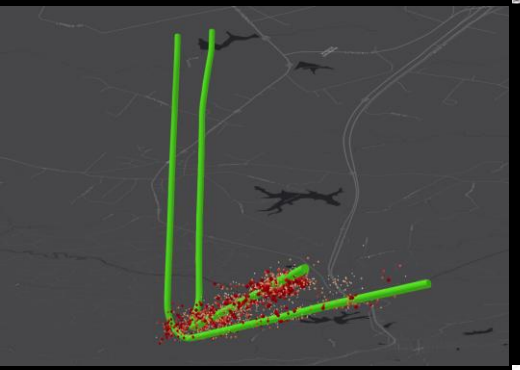
Oblique photogrammetry

BIM



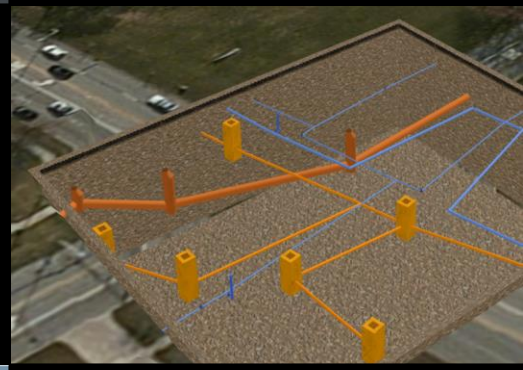
Indoor & subsurface scanning

Real-time (4D)



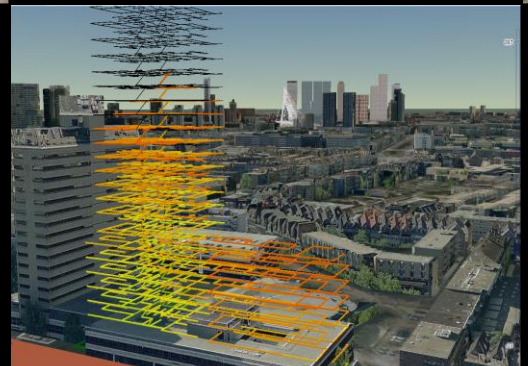
IoT

Textured Meshes



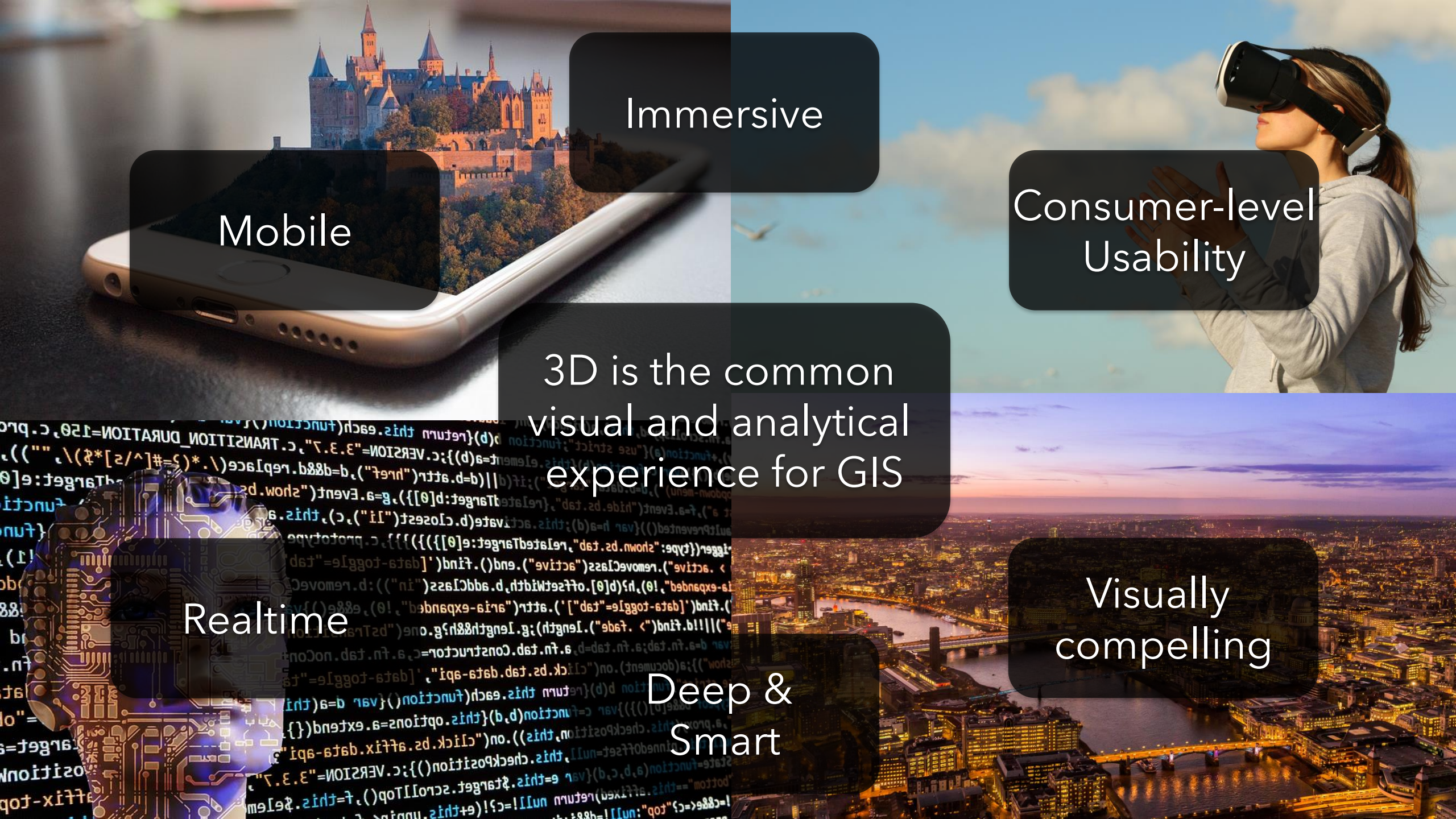
FMV

Spherical & panoramic imagery



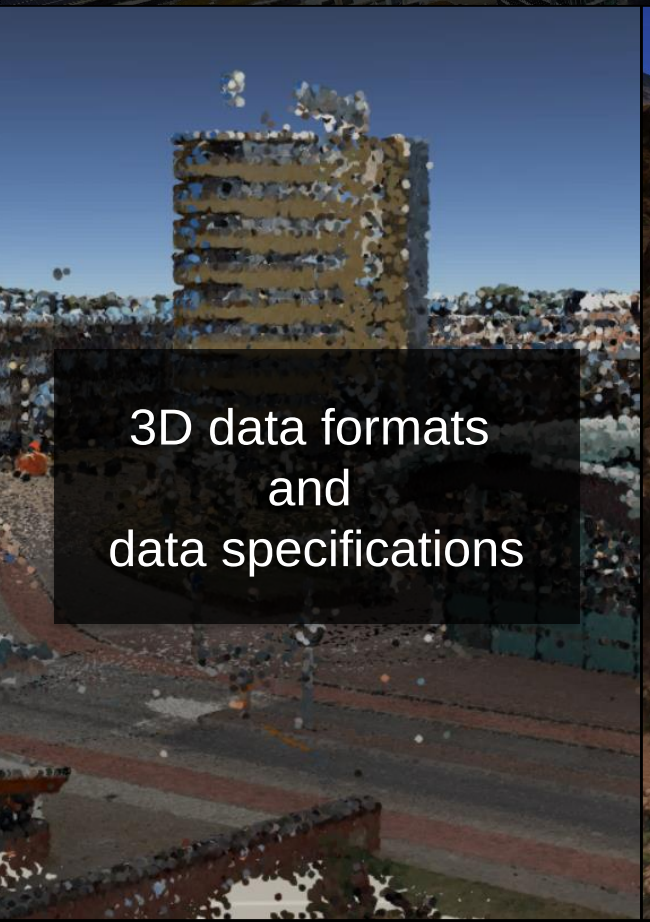
UAV

Data availability is driving
demand for new experiences

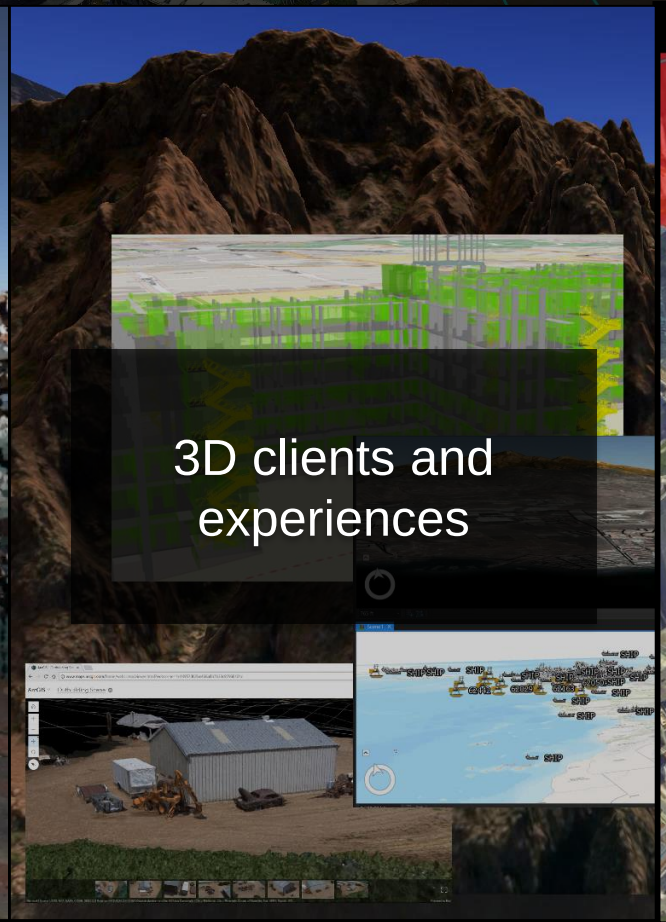

Immersive
Mobile
Consumer-level Usability
3D is the common visual and analytical experience for GIS
Realtime
Visually compelling
Deep & Smart

More accurate representation of the real world
Communicate with non-technical stakeholders
Value of 3D
Visualize features that don’t exist or that can’t be seen
Analyze behavior and aesthetics
About

ArcGIS is a Comprehensive 3D GIS

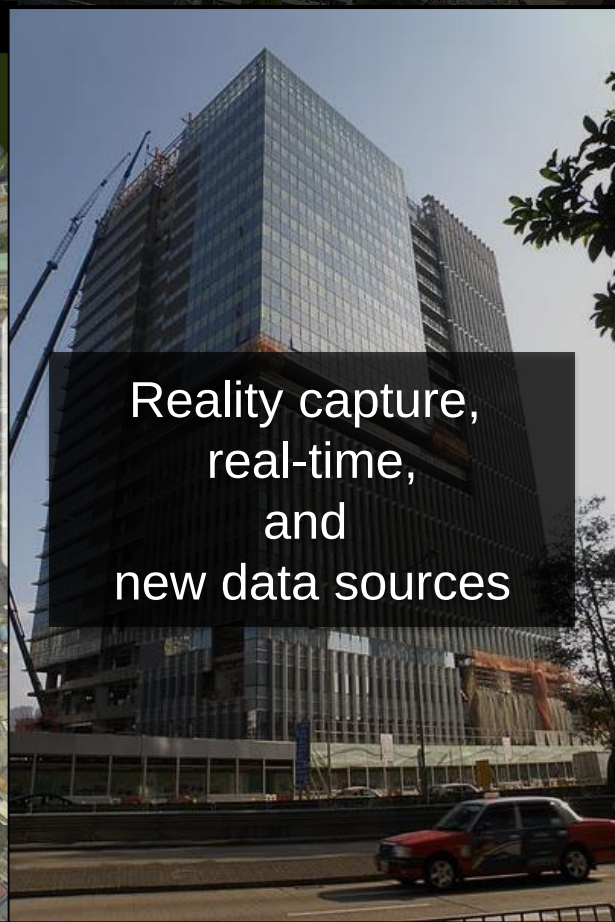


3D data formats
and
data specifications



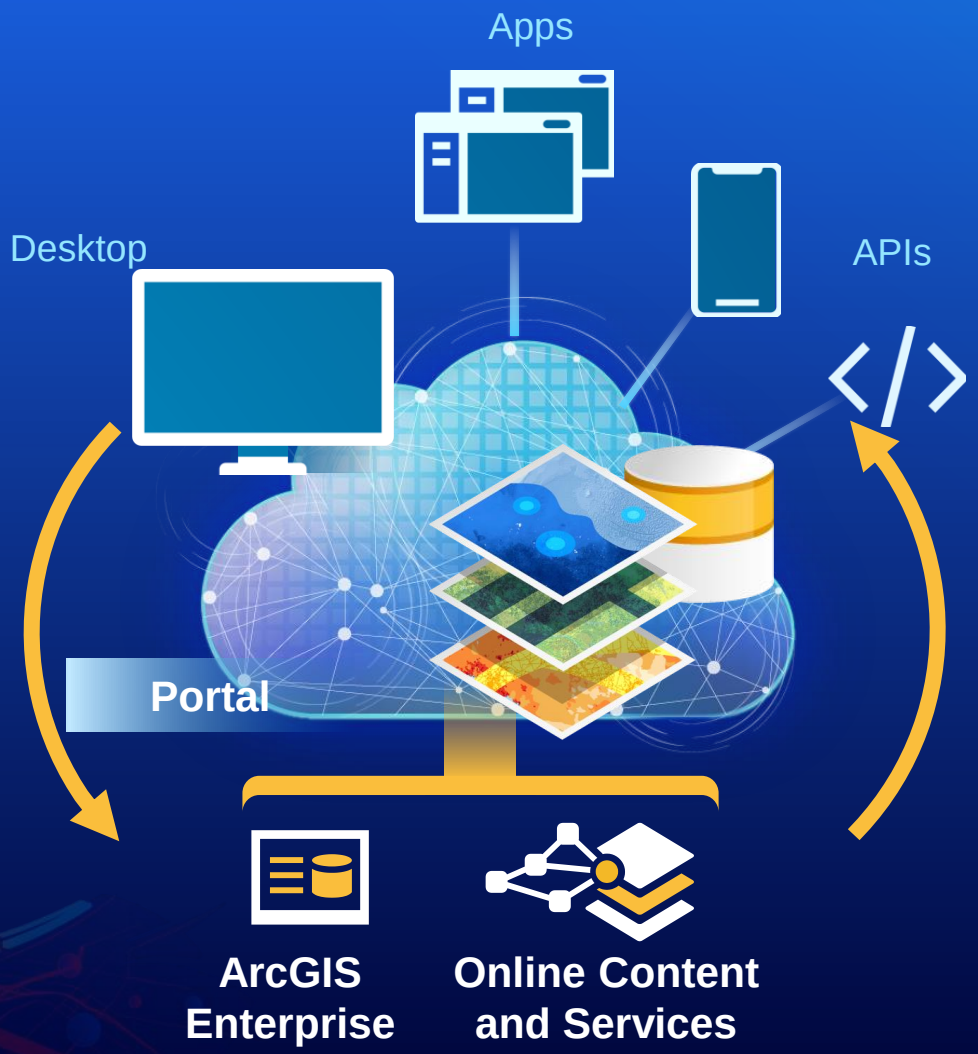
3D clients and
experiences

3D Analysis &
Simulation

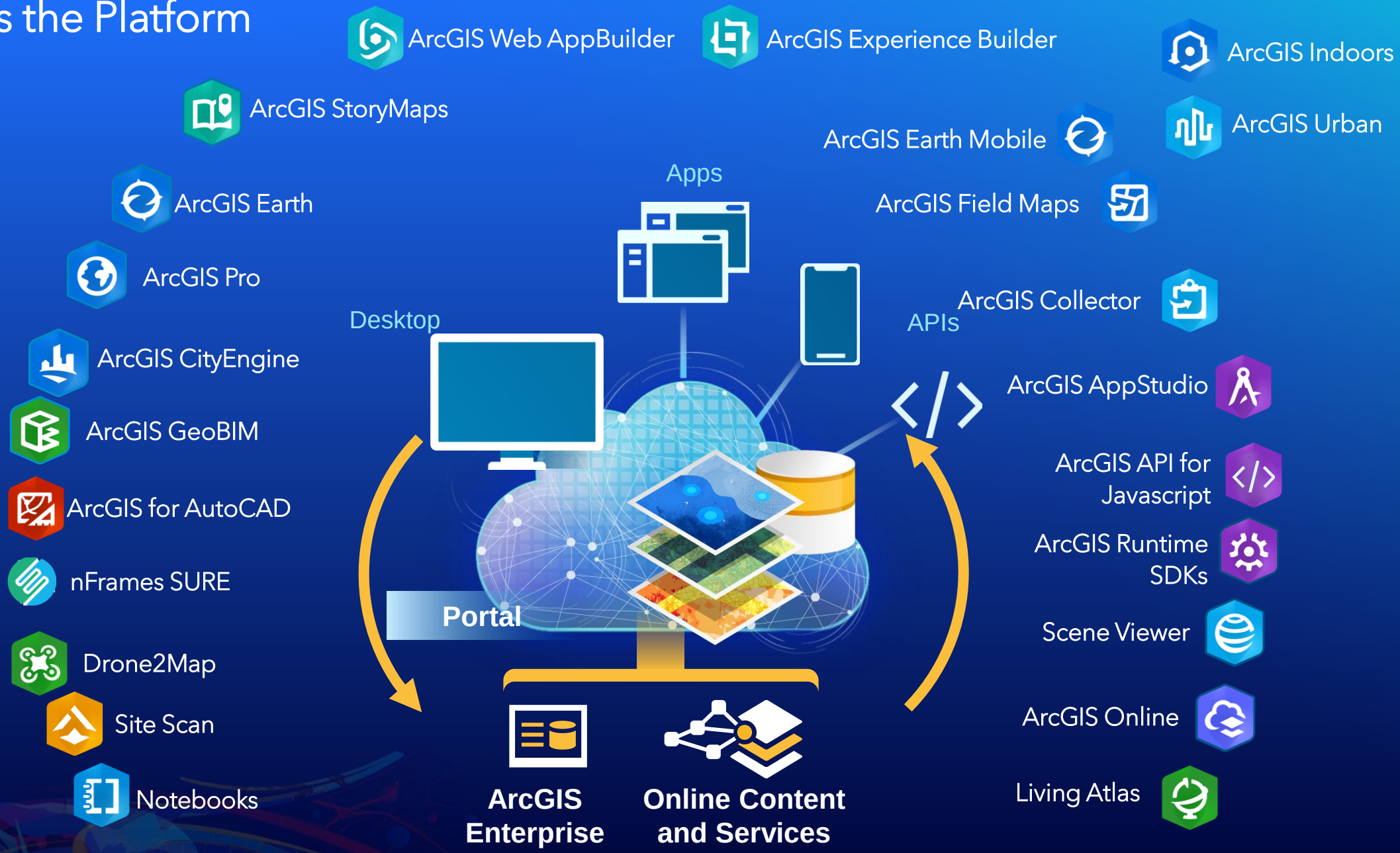


Reality capture,
real-time,
and
new data sources

3D Across the Platform



3D Across the Platform

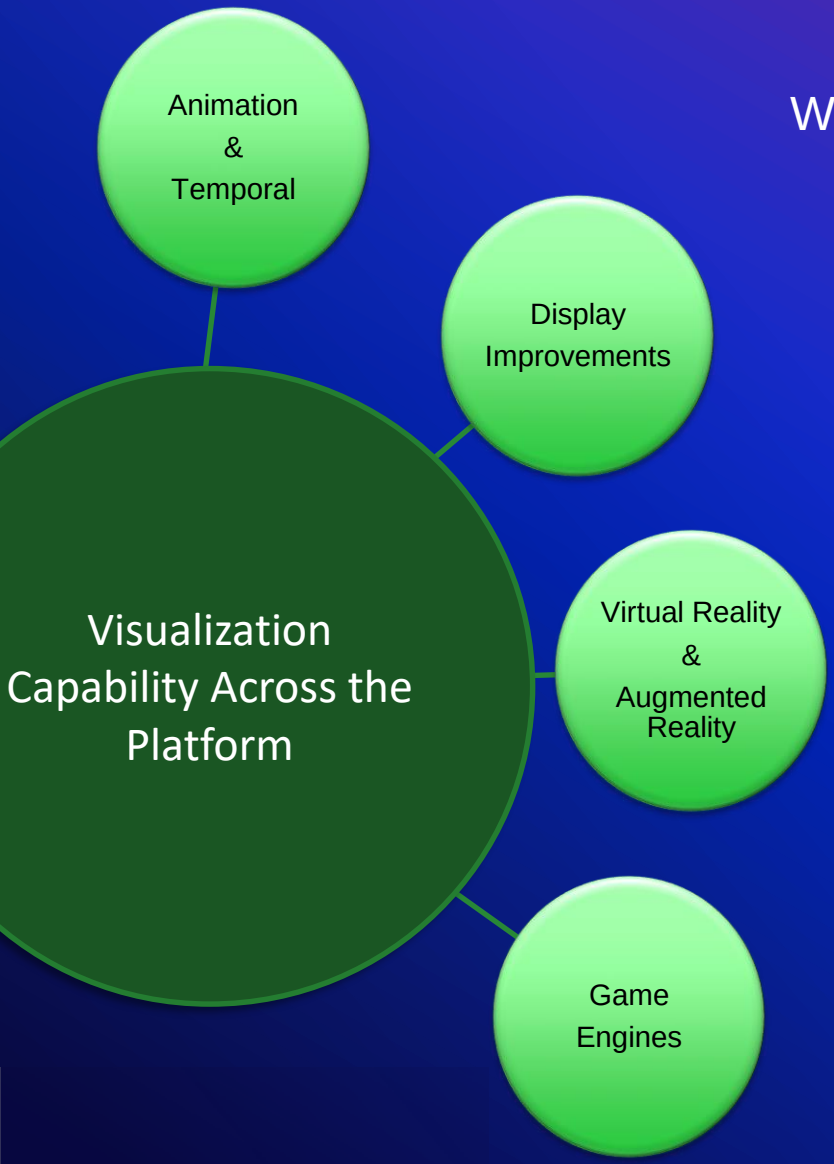


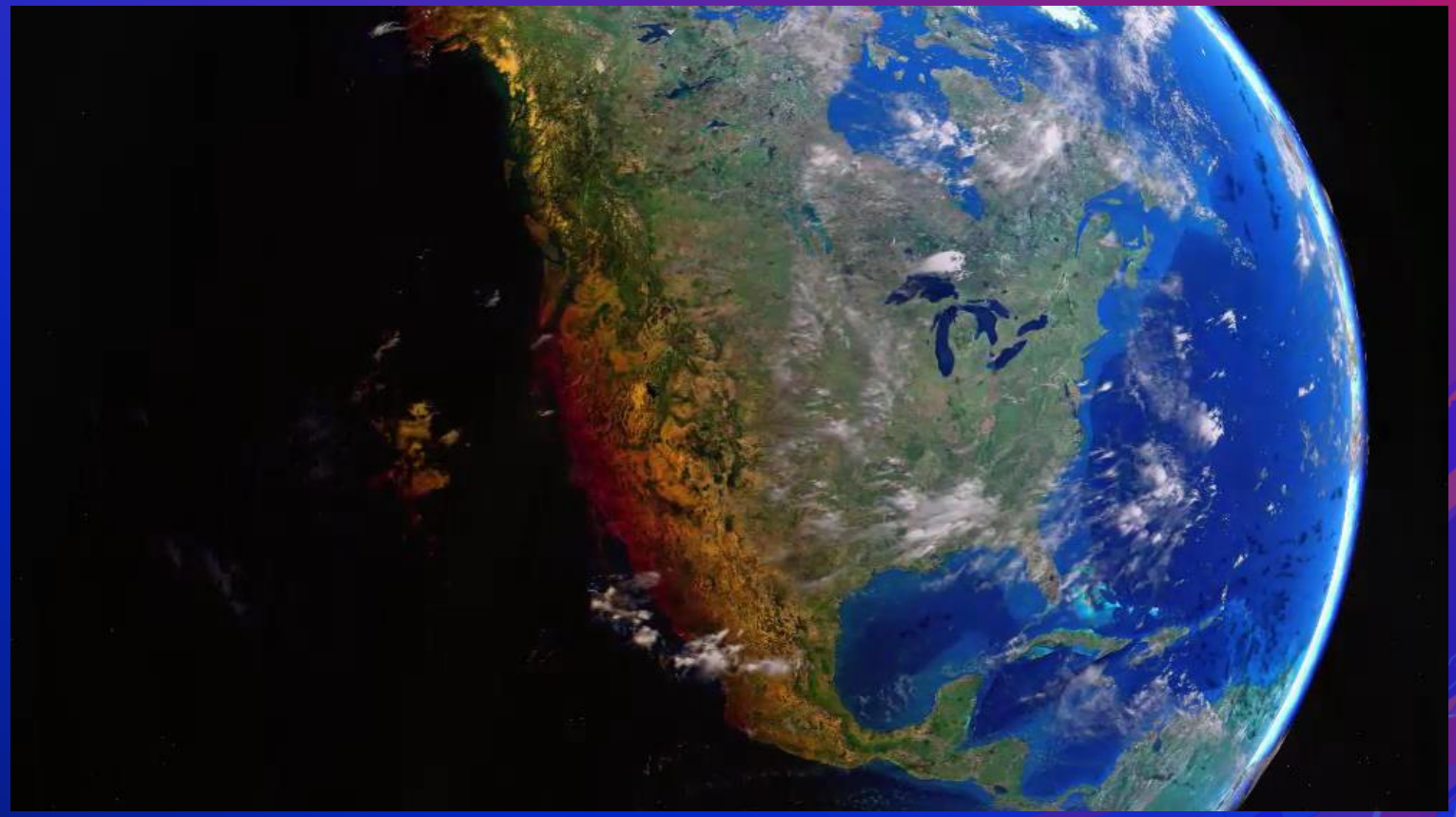
ArcGIS

Visualization Capabilities

ArcGIS Visualization Capabilities

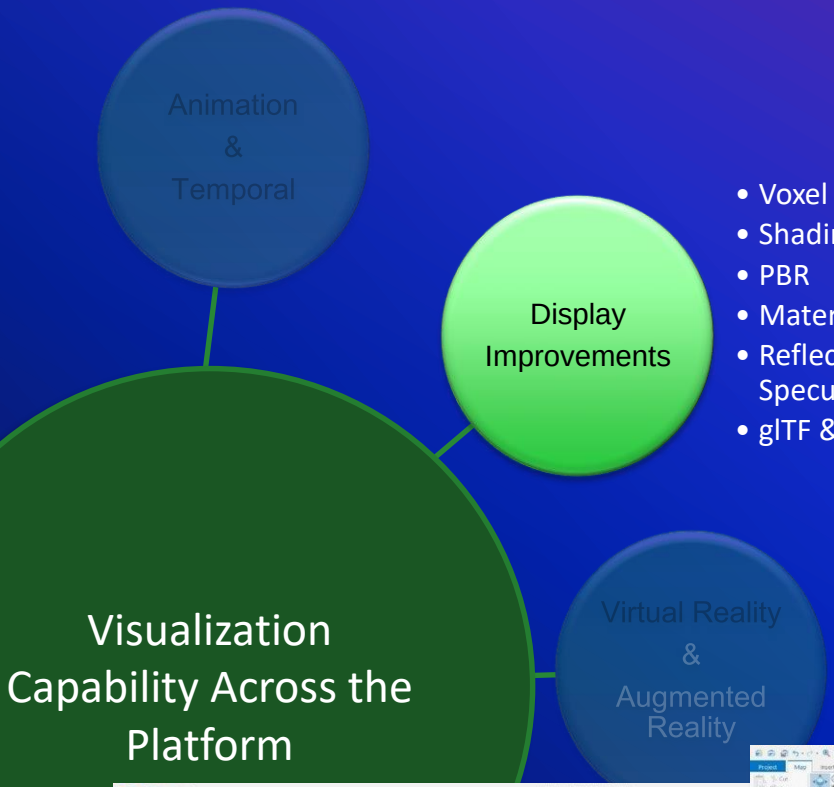
We are investing in creating compelling 3D GIS with enhanced visualization.



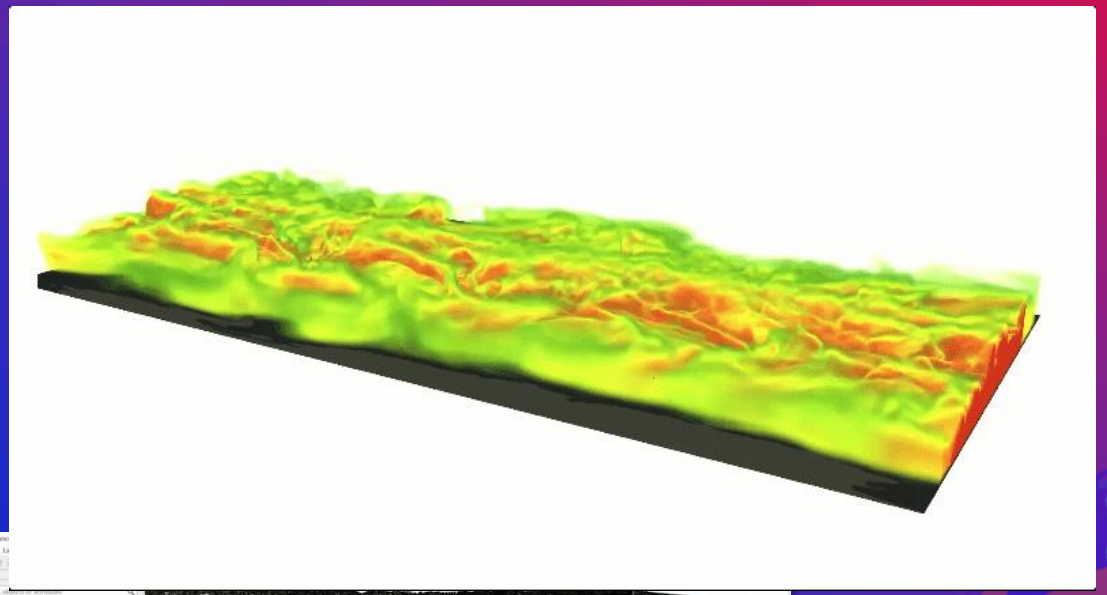


Enhanced Visual Aesthetics

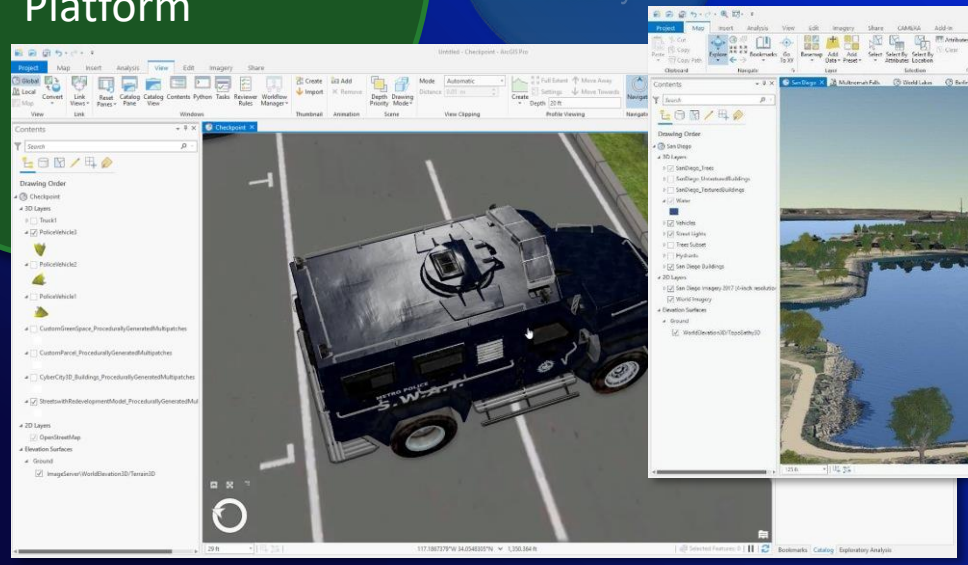
How things look is important…



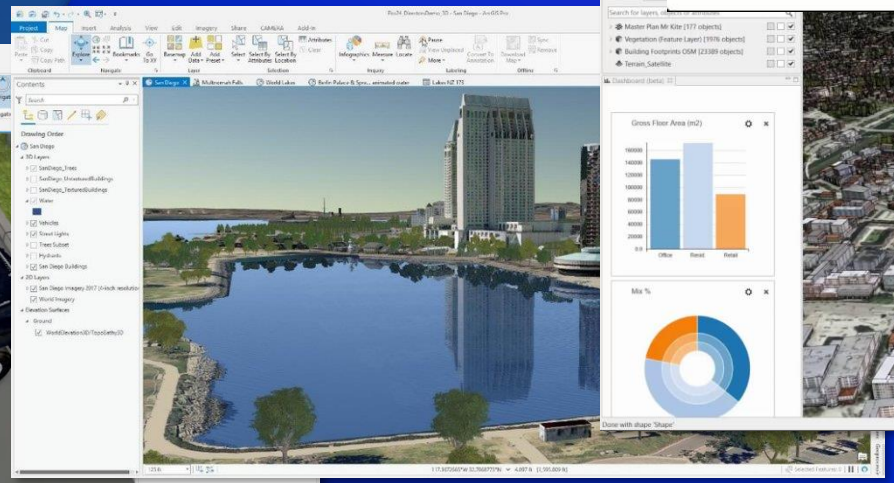
- Voxel Rendering
- Shading & Ambient Occlusion
- PBR
- Materials
- Reflection, Transparency, & Specular Highlights
- glTF & GLB



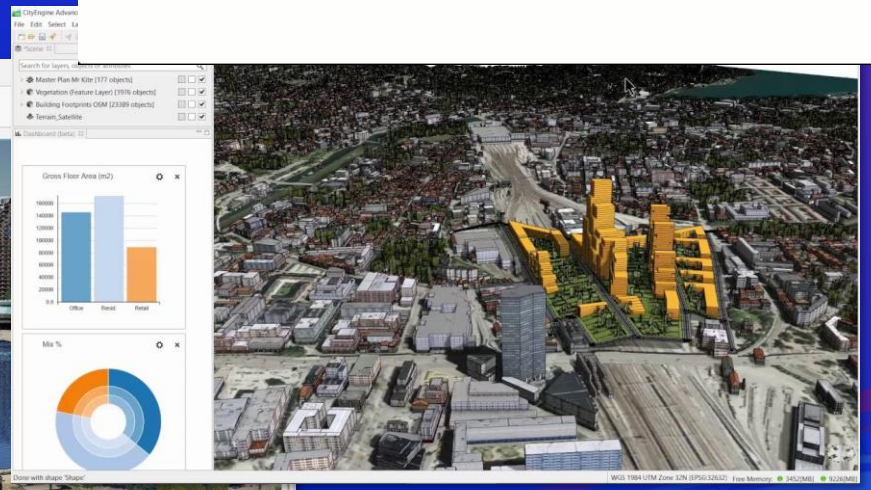
Voxel Rendering



glTF



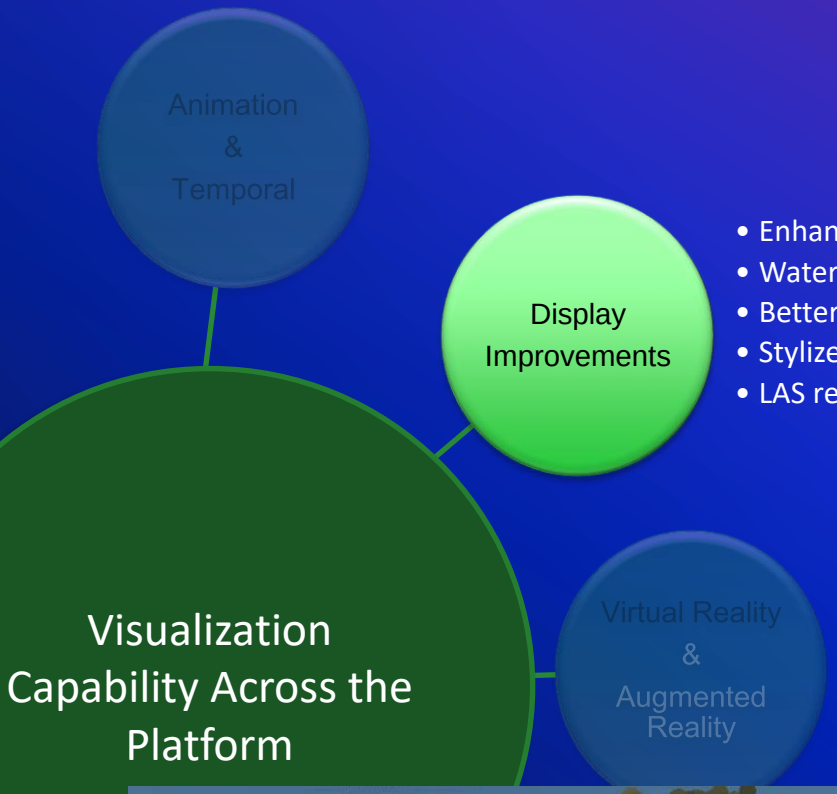
Improved Materials



Ambient Occlusion

Enhanced Visual Aesthetics

Rendering details & improving visual aesthetics highlight complex data.



- Enhanced Lighting
- Water
- Better visualization of symbology
- Stylized Content (i.e. Sketch Edges, Solid Edges)
- LAS rendering (colors, depth, etc.)

Sketch Edges

Rich 2D & 3D Symbology

Colorize LAS

Water Shader

Game Engine Integration

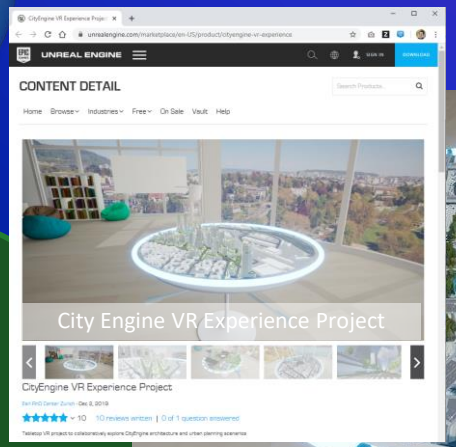
We are building tools & connections to make using game engines easier for you.

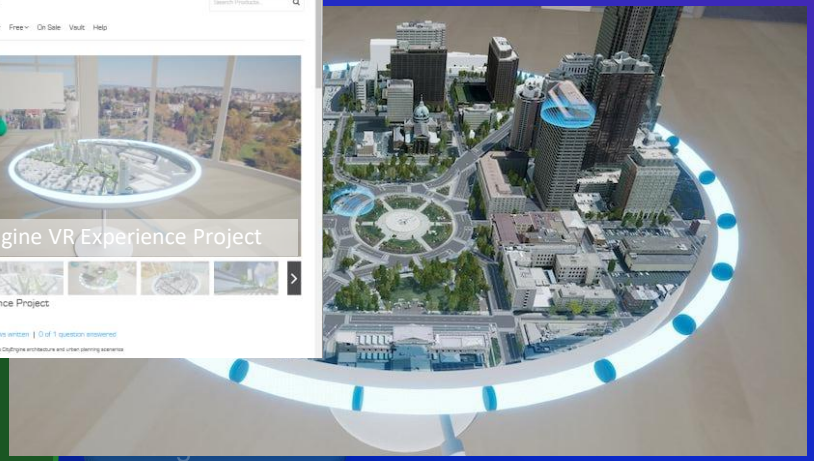
Animation & Temporal

Visualization Capability Across the Platform

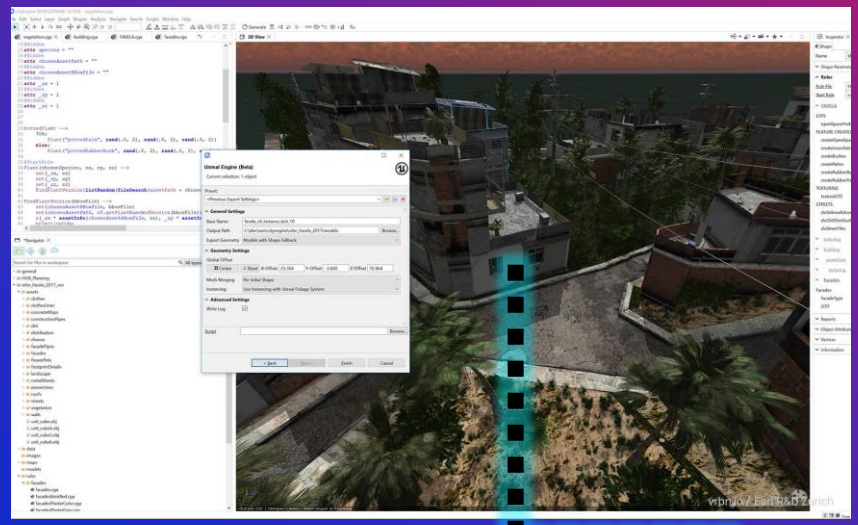
Reality

Game Engines





Esri in the Unreal Marketplace



ArcGIS Maps SDK for Game Engines
- ArcGIS Unreal Engine SDK
- ArcGIS Unity SDK

City Engine & VR Workflows
- City Engine VR Experience
- Integration with Unreal & Unity
  - Datasmith (Unreal Engine)
  - Publishing to VR & AR

CityEngine to Unreal Engine via Datasmith

https://www.unrealengine.com/en-US/blog/unreal-studio-brings-cityengine-neighborhood-to-life

Virtual & Augmented Reality Solutions

Virtual Reality immersion made easy

Improvements

Visualization Capability Across the Platform

Virtual Reality & Augmented Reality

Game Engines

CityEngine 360 Visibility (3VR format)

ArcGIS 360 VR
- Mobile VR app (Gear VR)
- Lightweight
- Navigation via hotspots
- Virtual Data Overlays
- 360 Visibility (City Engine)
  Esri 3VR format

City Engine VR Experience
- Premium VR app (HTC Vive & Oculas Rift)
- Tabletop Experience
- Improved Interactive Tools
- Improved Sun Positioning & Lighting
- Realistic Water Animation

ArcGIS Runtime
- Take advantage of device sensors
- Transparent Background
- Stereo Display

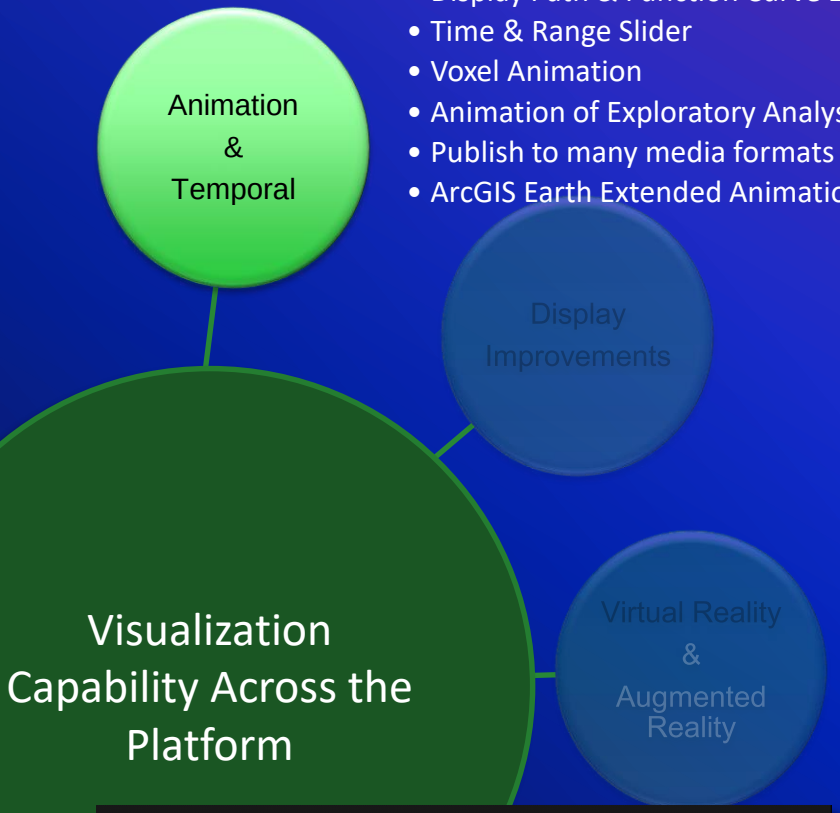
Try it out now with Gear VR: bit.ly/360_VR

Gear VR

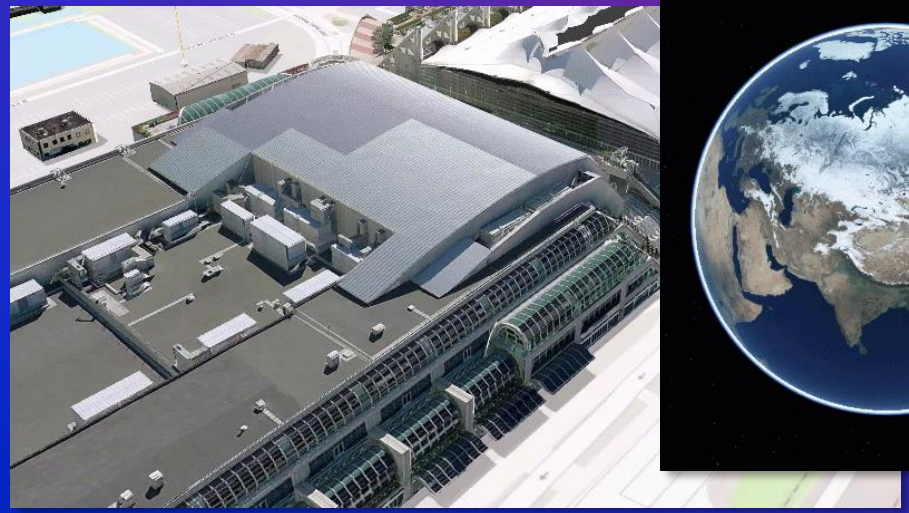
See the Webinar: bit.ly/CityEngine-Unreal

Animation & Temporal Visualization

Presenting data is enhanced through motion and time.

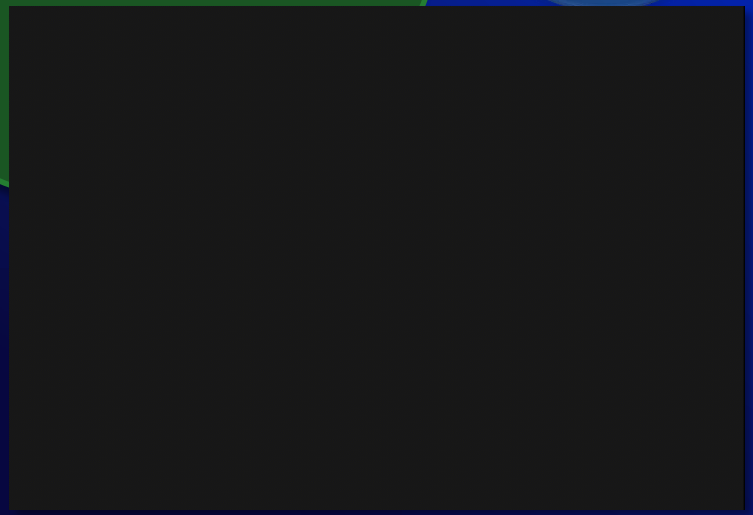


- Display Path & Function Curve Edits
- Time & Range Slider
- Voxel Animation
- Animation of Exploratory Analysis Tools
- Publish to many media formats
- ArcGIS Earth Extended Animation Toolset

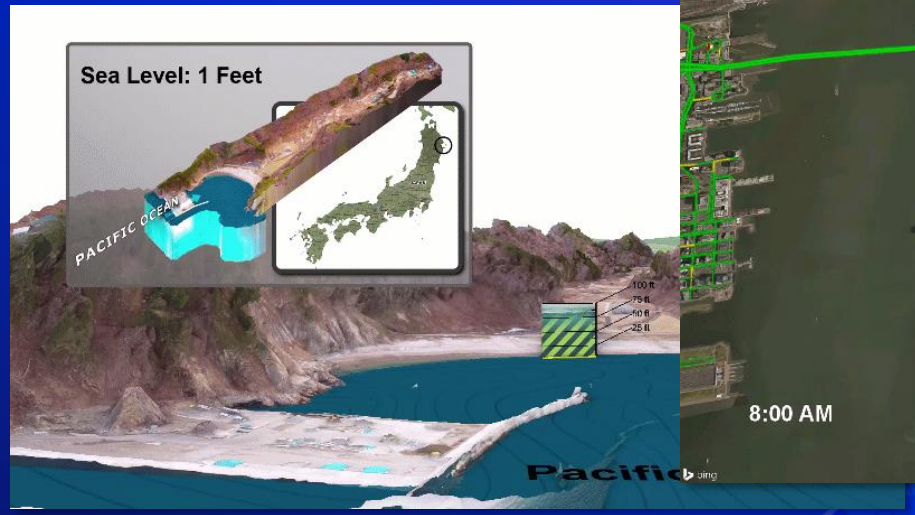


Present complex 3D with animation

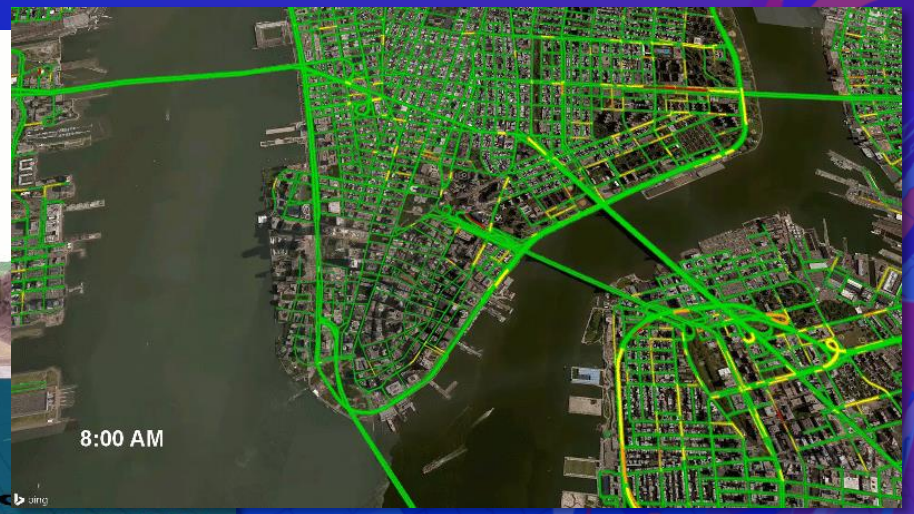
Communicate change and patterns



Animate Analysis to find answers



Present with images and text.



View & capture live temporal data.

ArcGIS

3D Analysis Capabilities

3D Analysis

Lidar Classification and supporting tools

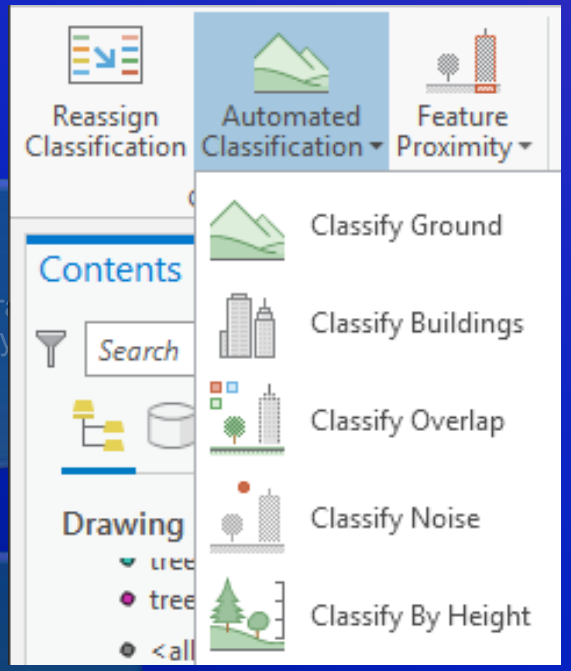
LiDAR Classification

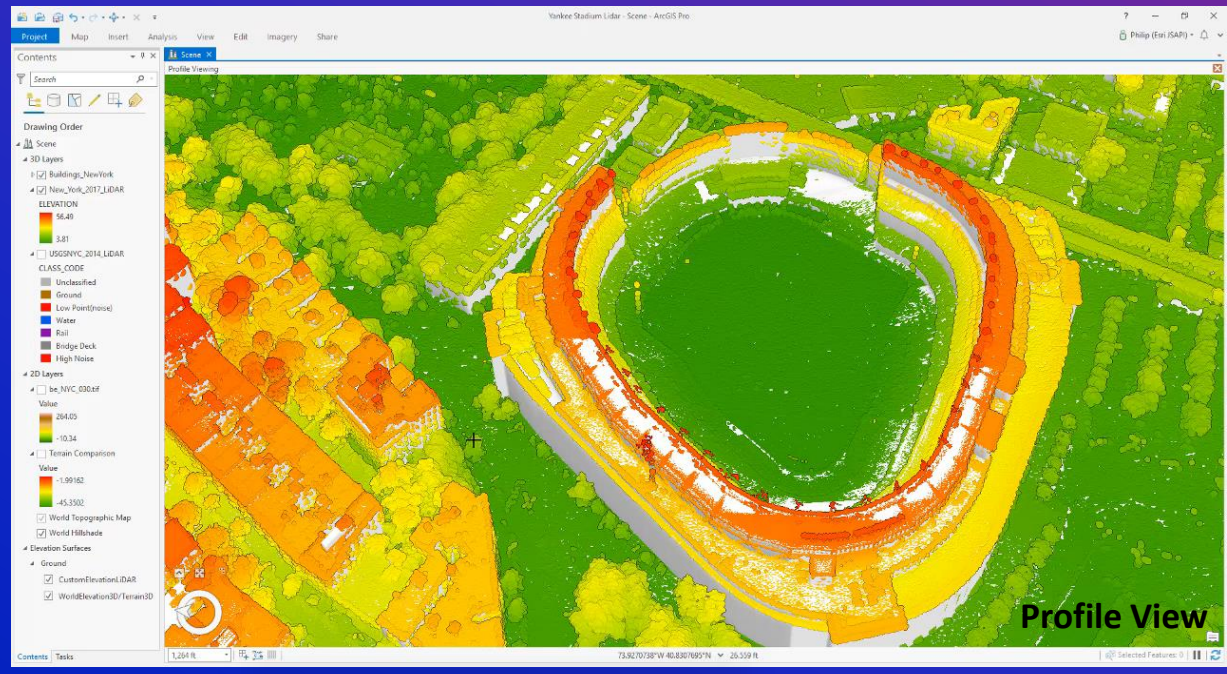
3D Analysis

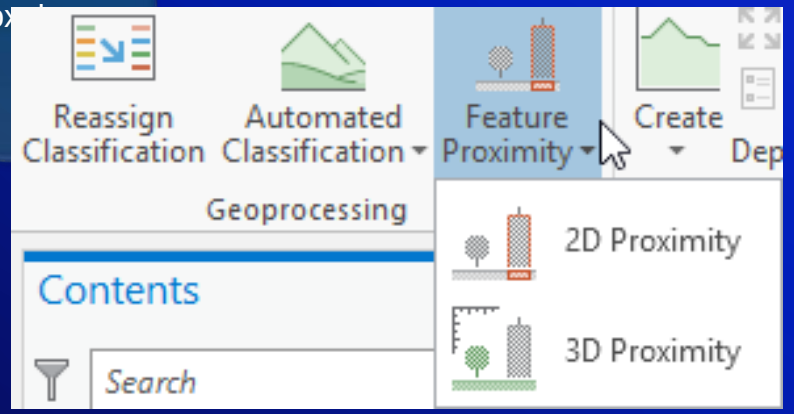
Explora Analy

Vox

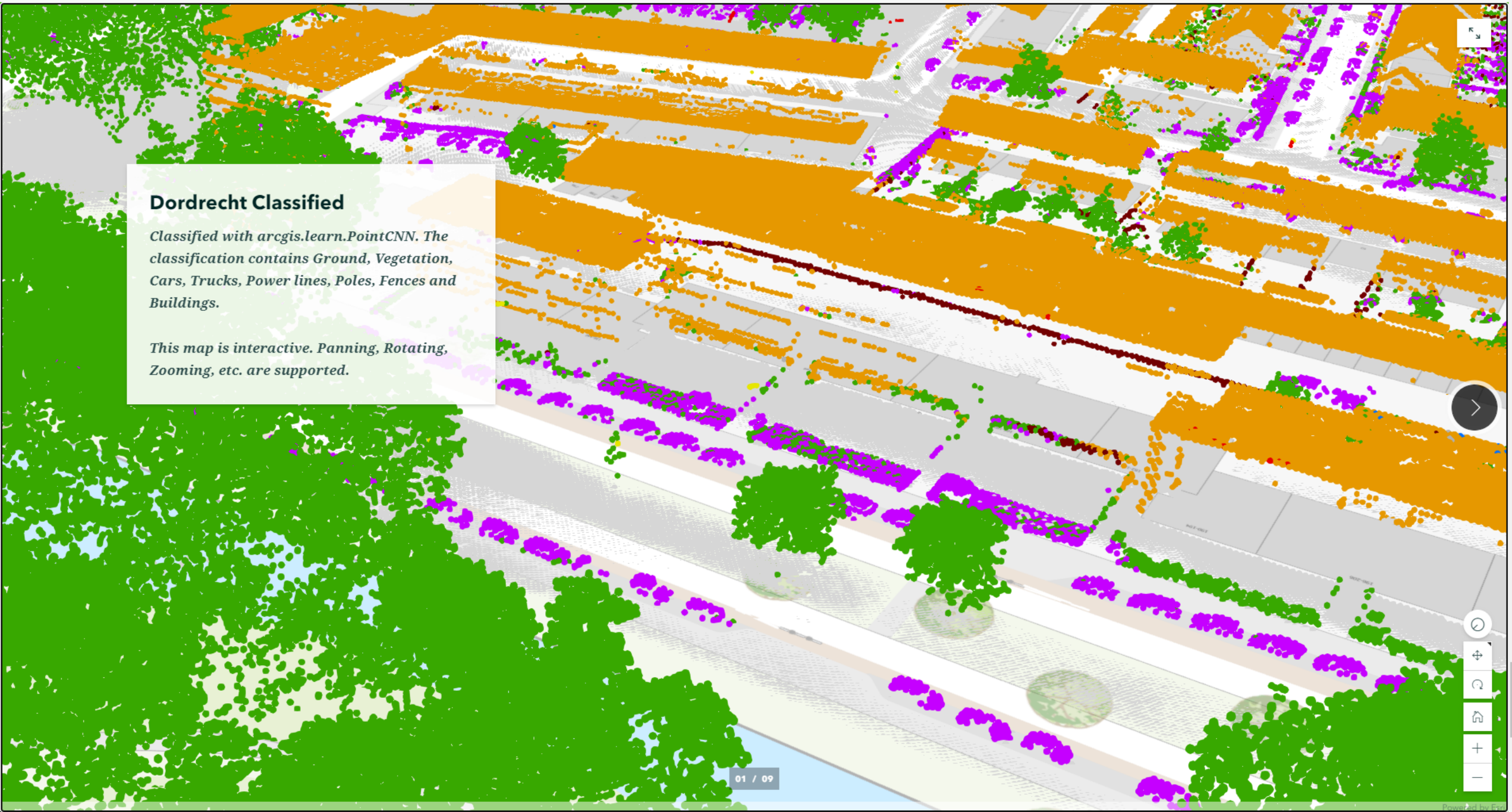
3D Solutions



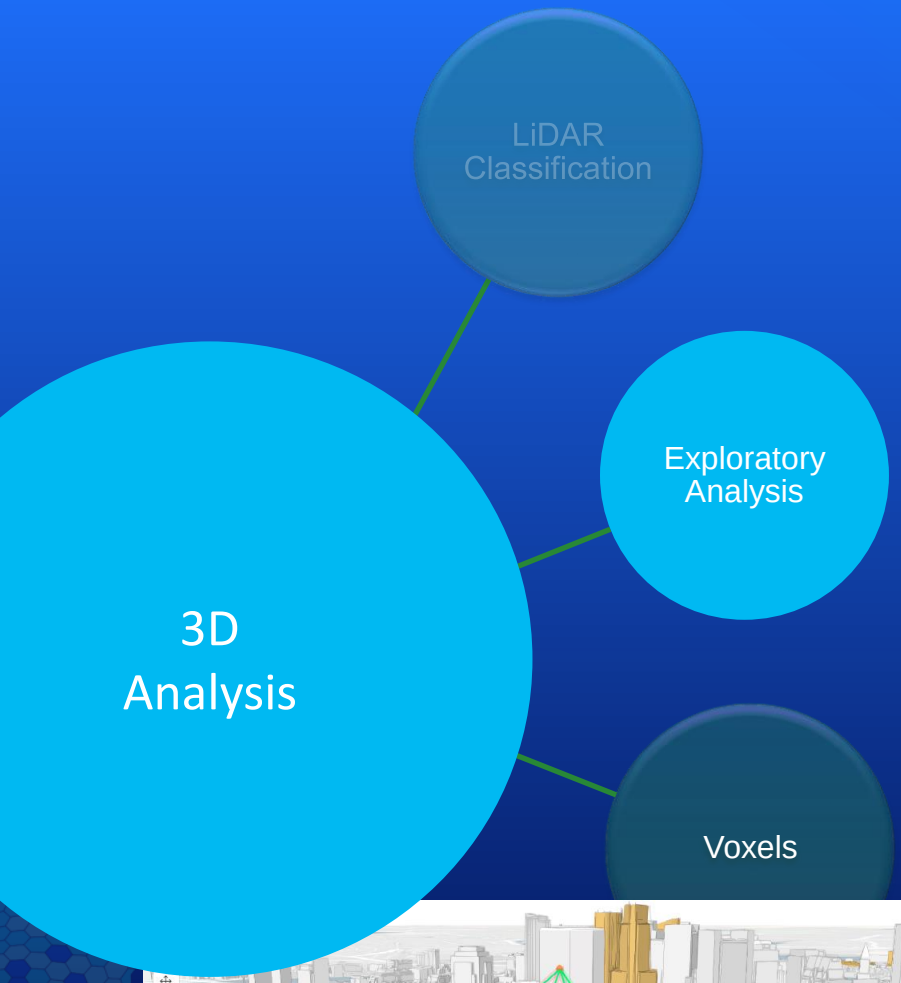


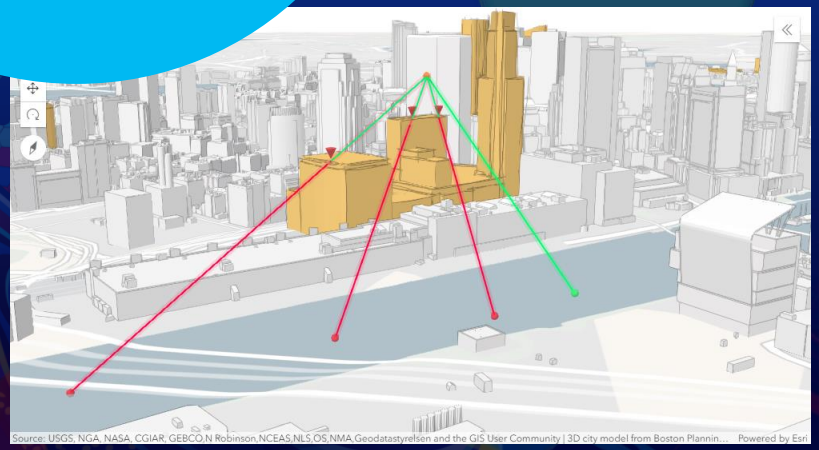


Colorize LAS


Dordrecht Classified
Classified with arcgis.learn.PointCNN. The classification contains Ground, Vegetation, Cars, Trucks, Power lines, Poles, Fences and Buildings.
This map is interactive. Panning, Rotating, Zooming, etc. are supported.
01 / 09

3D Analysis
Exploratory Analysis



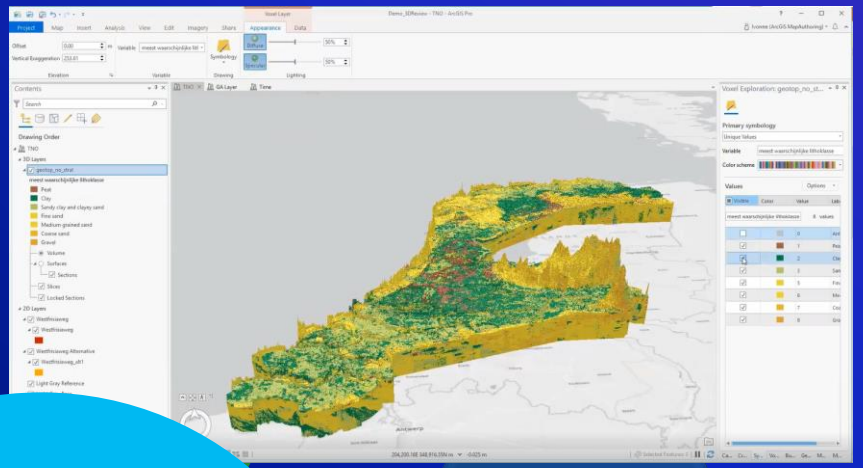


	Pro	Earth	Scene Viewer or JSAPI
Line of Sight	x	x	x
View Dome	x		
Viewshed	x	x	
Slice	x		x
Cut and Fill	x		

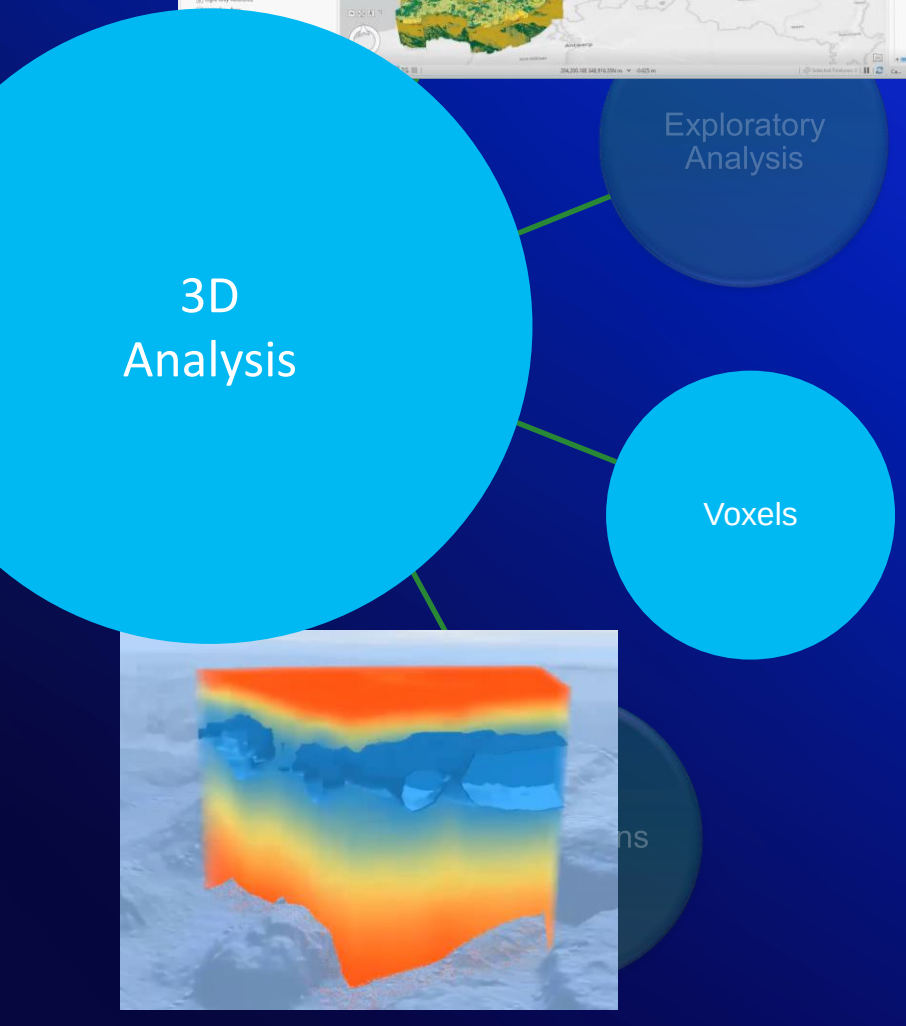
Exploratory Analysis Demo

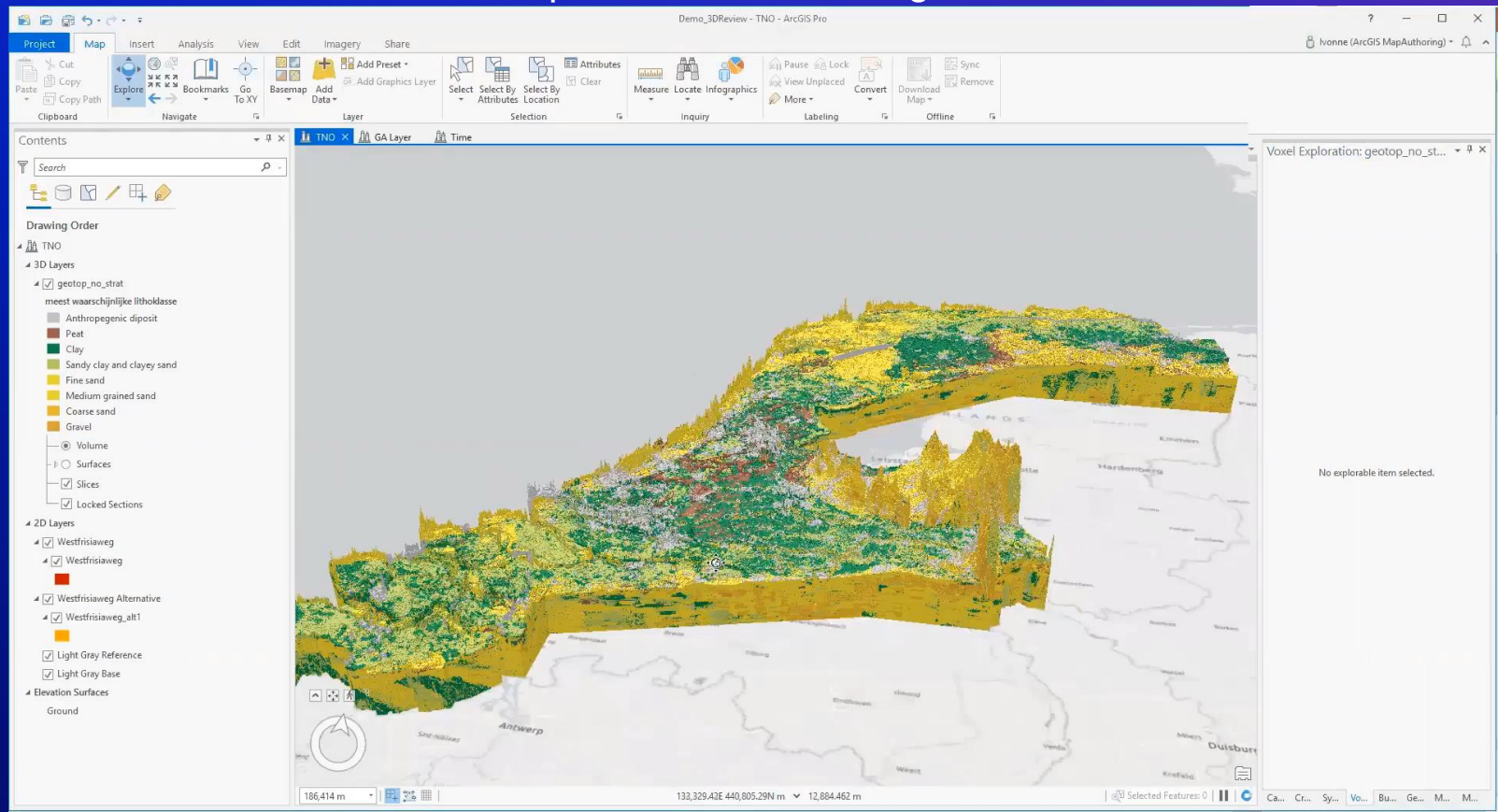
Stephen Heidelberg

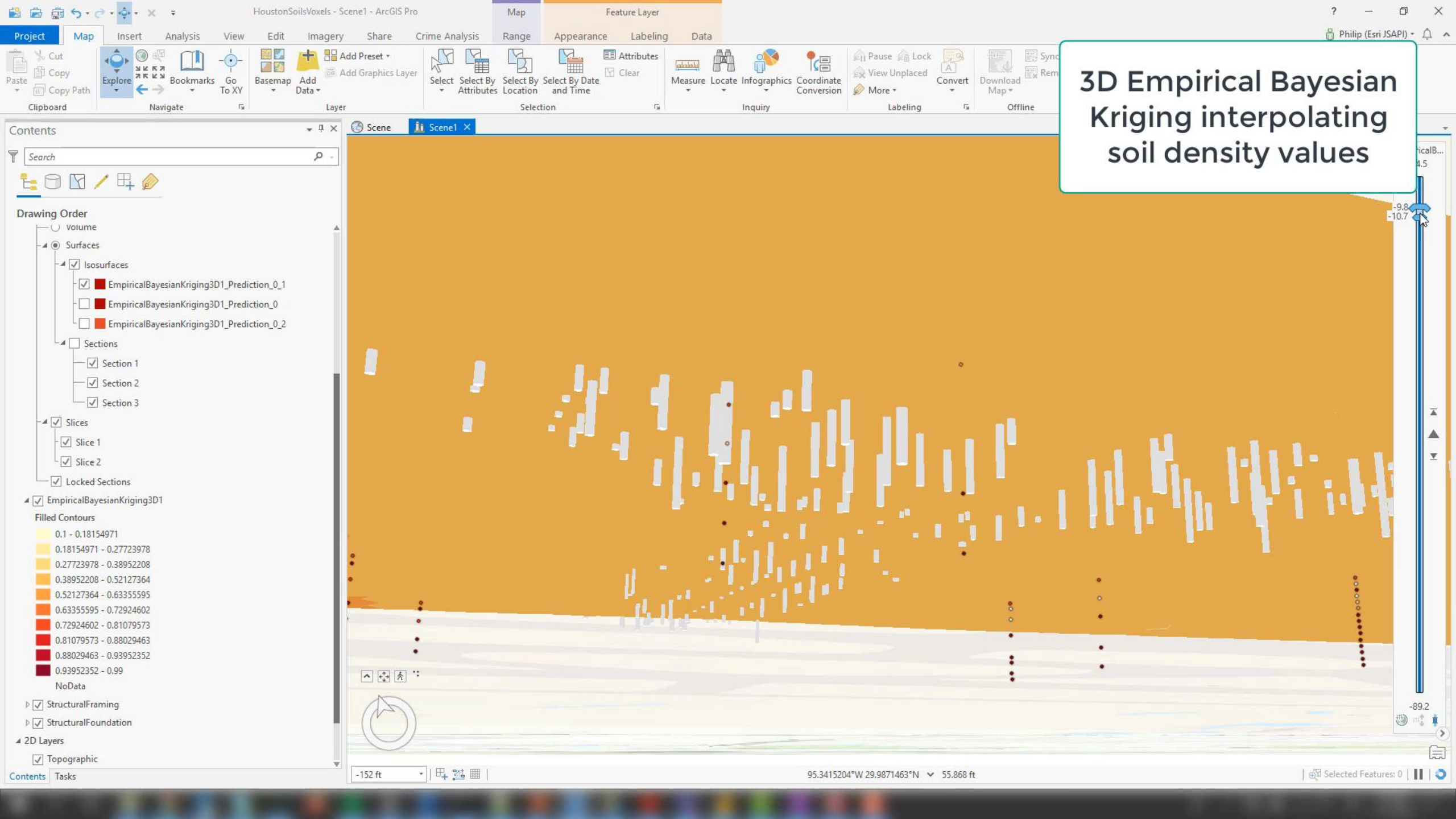
3D Analysis
Voxels



- Visualize large volumetric data
- Apply transparency gradients to focus on specific data
- Create multiple slices with moving, rotatable planes
- Create isosurfaces of the data
- Consume 3D EBK, Space time cube and gridded netCDF data



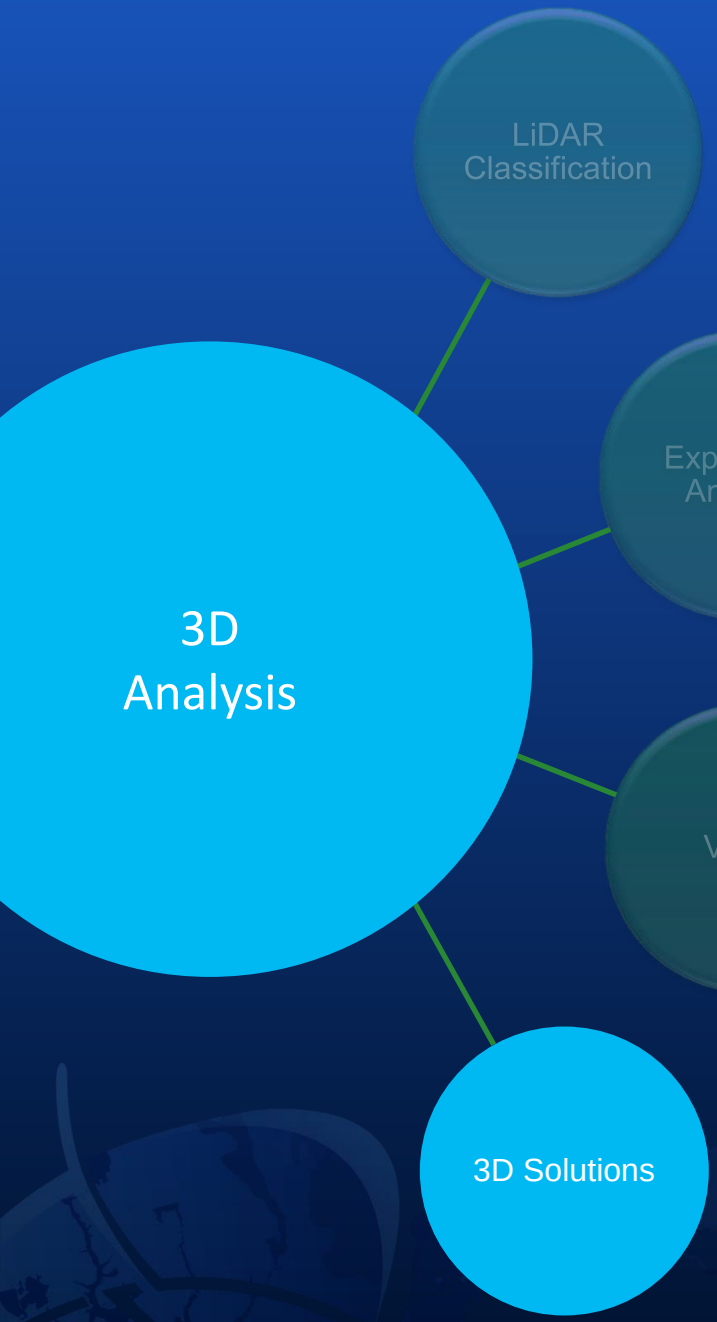


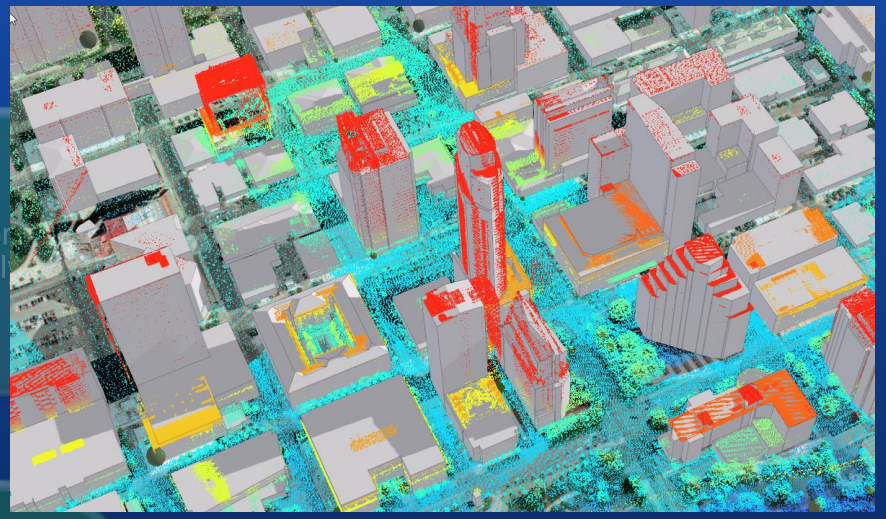

HoustonSoilsVoxels - Scene1 - ArcGIS Pro
Map
Feature Layer
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Crime Analysis
Range
Appearance
Labeling
Data
Philip (Esri JSAPI)
Cut
Copy
Copy Path
Paste
Clipboard
Explore
Bookmarks
Go To XY
Navigate
Basemap
Add Data
Add Preset
Add Graphics Layer
Layer
Select
Select By Attributes
Select By Location
Select By Date and Time
Attributes
Clear
Selection
Measure
Locate
Infographics
Coordinate Conversion
Inquiry
Pause
Lock
View Unplaced
More
Convert
Labeling
Download Map
Offline
3D Empirical Bayesian Kriging interpolating soil density values
Contents
Search
Drawing Order
Volume
Surfaces
Isosurfaces
EmpiricalBayesianKriging3D1_Prediction_0_1
EmpiricalBayesianKriging3D1_Prediction_0
EmpiricalBayesianKriging3D1_Prediction_0_2
Sections
Section 1
Section 2
Section 3
Slices
Slice 1
Slice 2
Locked Sections
EmpiricalBayesianKriging3D1
Filled Contours
0.1 - 0.18154971
0.18154971 - 0.27723978
0.27723978 - 0.38952208
0.38952208 - 0.52127364
0.52127364 - 0.63355595
0.63355595 - 0.72924602
0.72924602 - 0.81079573
0.81079573 - 0.88029463
0.88029463 - 0.93952352
0.93952352 - 0.99
NoData
StructuralFraming
StructuralFoundation
2D Layers
Topographic
Contents
Tasks
Scene
Scene1
-9.8
-10.7
-89.2
-152 ft
95.3415204°W 29.9871463°N
55.868 ft
Selected Features: 0

3D Analysis

3D Solutions

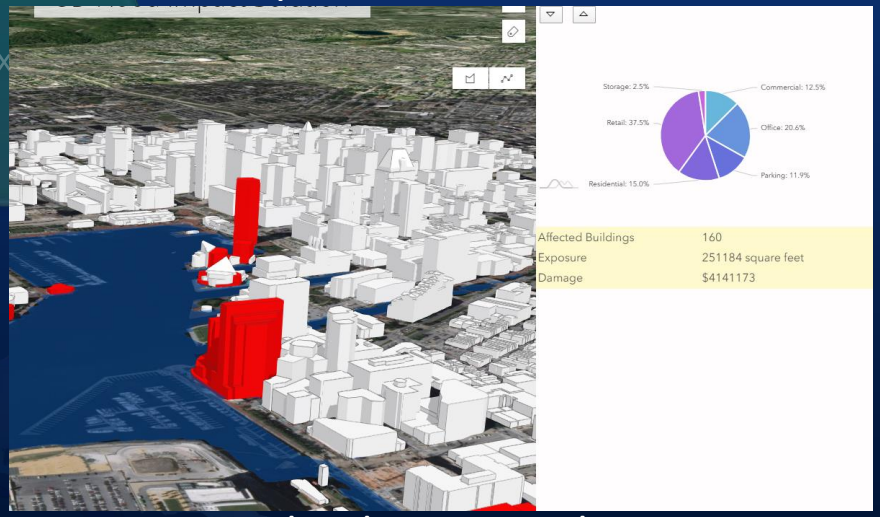
- ArcGIS Pro Task-based workflows for industry-based analysis and derived data





3D Basemap Solution

3D Tools for Power lines



3D Flood Impact Solution

Visibility Assessment Solution

ArcGIS

3D Content Creation, Editing and Data Management

Content Creation, Editing and Data Management

Distributed Collaboration

Distributed Collaboration

Content Creation, Editing and Data Management

Scene Layers

Feature Layers

Editing Improvements

Large Uploads and Enterprise Considerations

- Establishes a **trusted connection** with other ArcGIS Enterprise environments and ArcGIS Online
- Allows you to quickly and easily **share data and information** across systems
- Helps provide a **common operational picture** of data and make it **visible** and **usable** across environments

Content Creation, Editing and Data Management

Scene Layers

Author

Clients:

- ArcGIS Pro
- CityEngine
- 3rd party vendors

Publish

Clients:

- ArcGIS Pro (To ArcGIS online or to ArcGIS Enterprise)
  ArcGIS Enterprise (as a web scene layer from feature layer)
- ArcGIS Online (as a hosted web scene layer from feature layer)
- Upload slpk

Consume

Clients:

- ArcGIS Pro
- Web Scene Viewer
- ArcGIS Earth
- Runtime (Update 100.7)
- ArcGIS Earth Mobile

Maintain

Clients:

- ArcGIS Pro

Scene Layers use an open standard, I3S, to serve performant 3D experiences

Content Creation, Editing and Data Management

Point Scene Layer

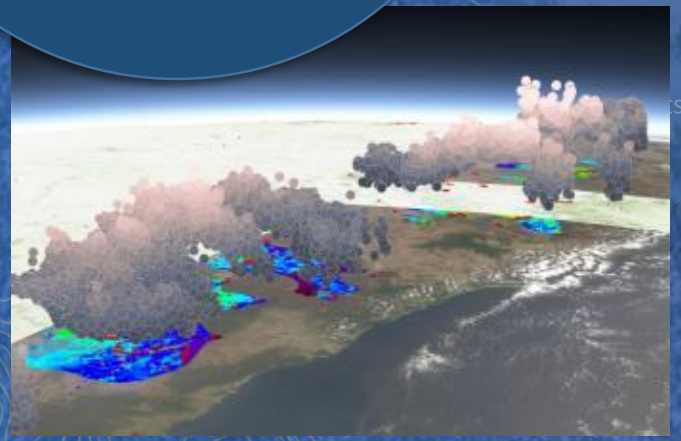
Distributed Collaboration

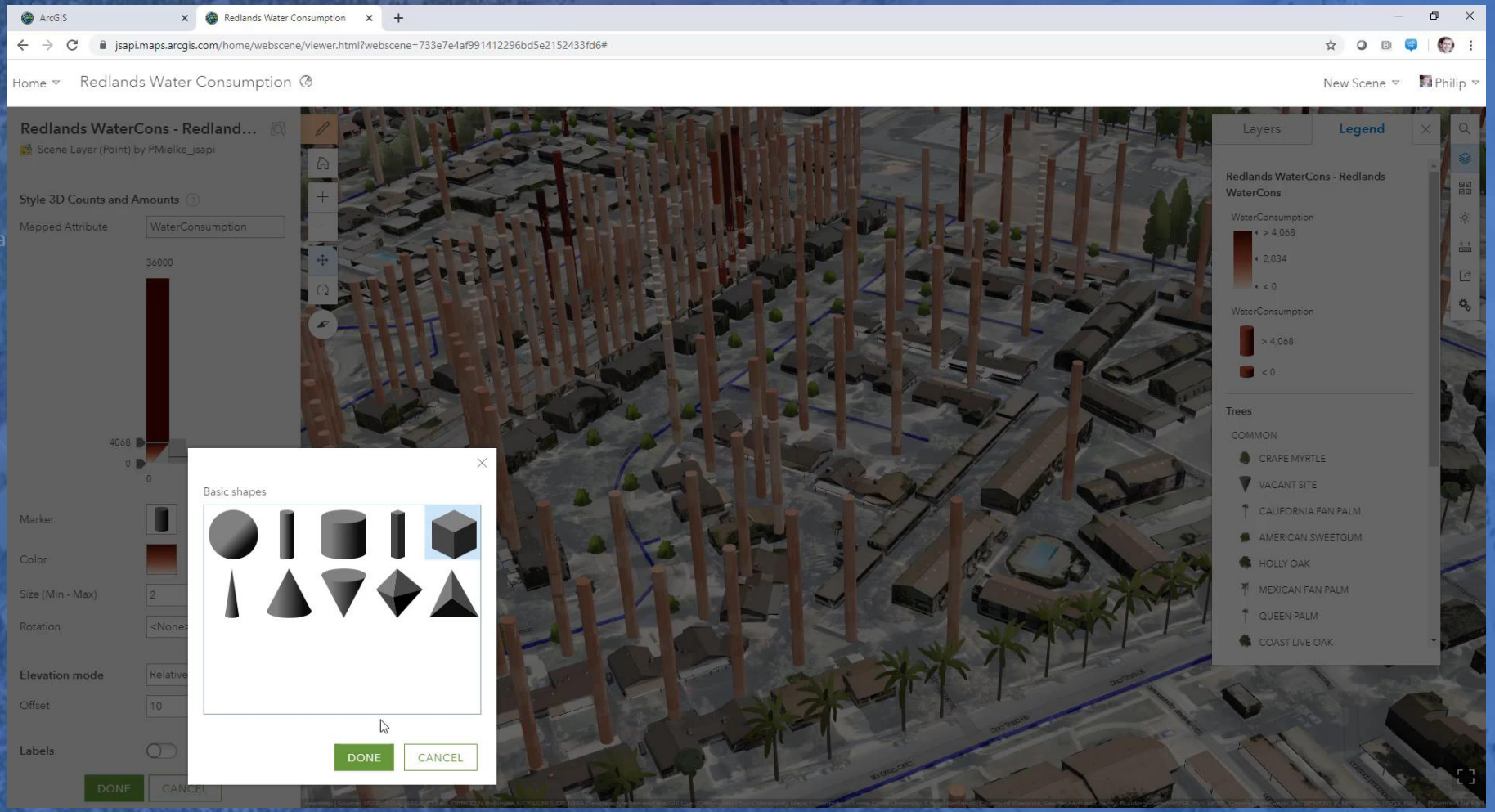
Scene Layers

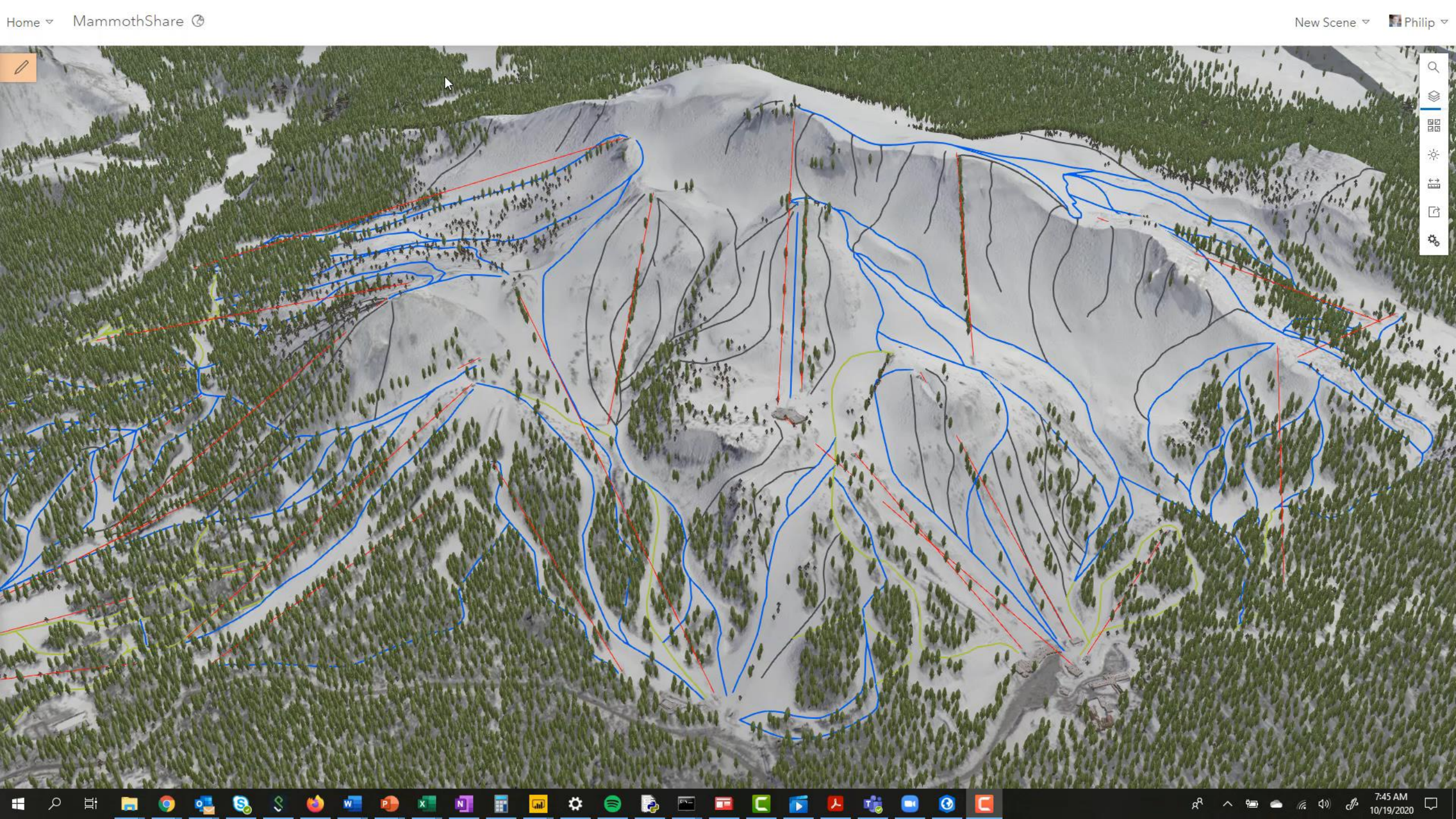
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene

Content Creation, Editing and Data Management

New! 1.7 I3S Spec is almost 2x as fast






Home
MammothShare
New Scene
Philip
7:45 AM
10/19/2020

Content Creation, Editing and Data Management

3D Object Scene Layer

Distributed Collaboration

Scene Layers

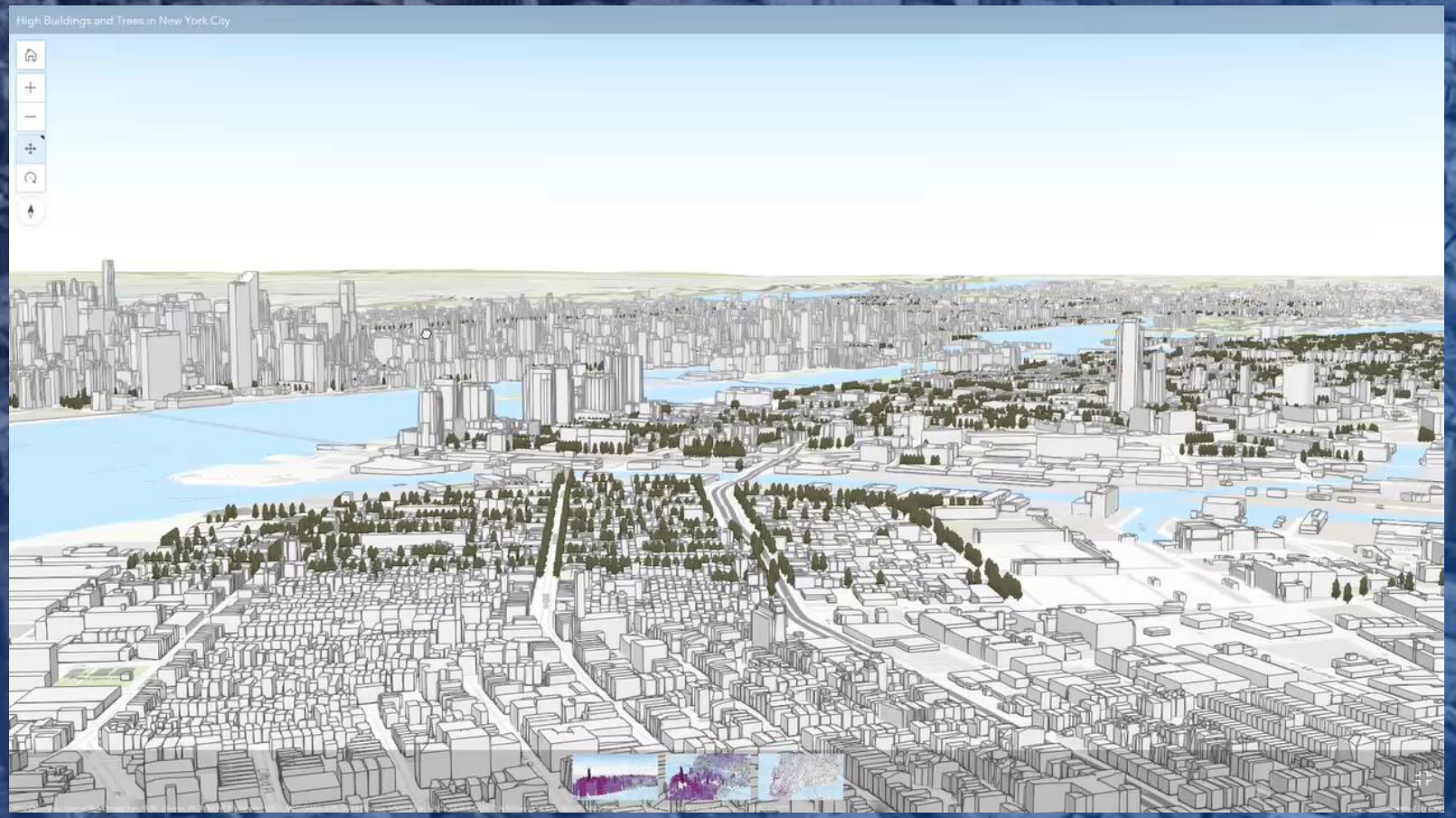
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

Content Creation, Editing and Data Management

Feature Layers

Editing Improvements

Large Uploads and Enterprise Considerations



Content Creation, Editing and Data Management

Point Cloud Scene Layer

Distributed Collaboration

Scene Layers

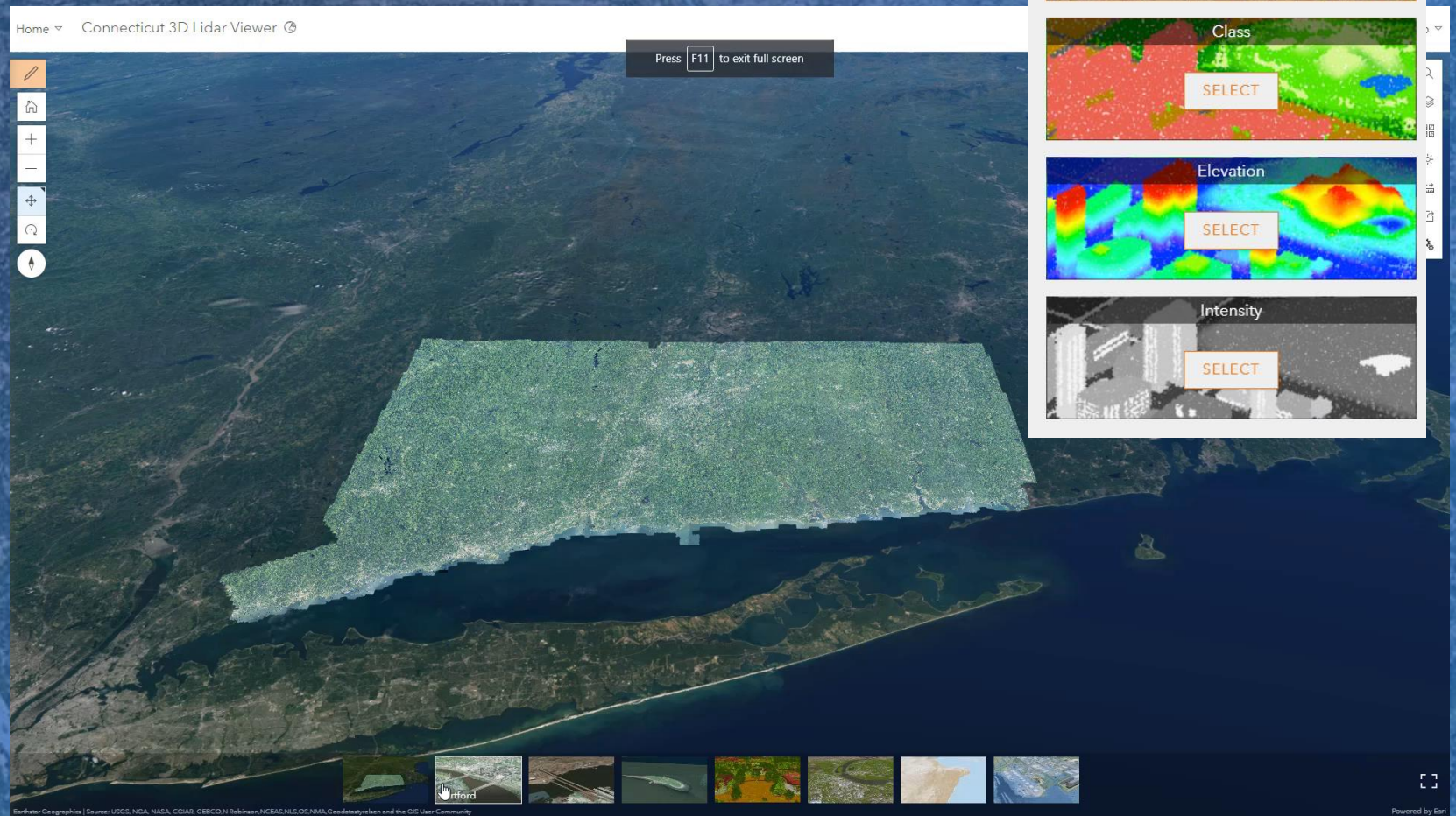
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

Content Creation, Editing and Data Management

Feature Layers

Editing Improvements

NEW!: Pop ups on Point Cloud Scene Layers



Content Creation, Editing and Data Management

Integrated Mesh Scene Layer

Distributed Collaboration

Scene Layers

- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building

Content Creation, Editing and Data Management

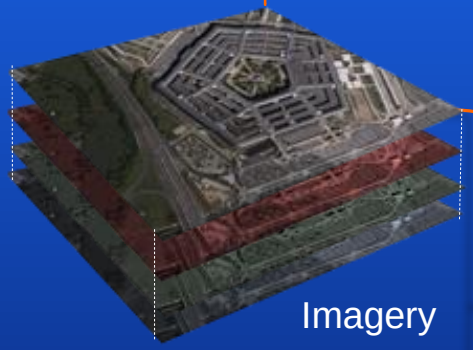
Feature Layers

Editing Improvements

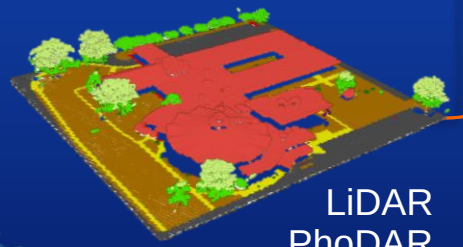
Large Uploads and Enterprise Considerations

Imagery Capture and Generation Solutions

ArcGIS Drone Collections



Imagery



LiDAR
PhoDAR

Drone2Map
Disconnected Environments (Desktop)

SiteScan
Connected Environments (Cloud)

- Ortho-Imagery
- 3D Mesh
- Photogrammetric Point-Cloud

SURE nFrames
Desktop & Distributed Processing

PROCESS **MASSIVE** AREAS
- On-NADIR Ortho-Imagery
- 3D Mesh
- Photogrammetric Point-Cloud
- Surface Models

ArcGIS Pro
Desktop Software

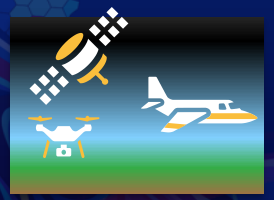
- Feature Extraction & Detection
- Elevation Rasters:
  - From LiDAR or Satellite Stereo-Pairs
- LiDAR Processing & Classification
- 3D Basemap Management

ArcGIS Online & Enterprise
Storage, Processing, Dissemination

ArcGIS Pro
Desktop Software

Imagery, 3D &
Remote Sensing Data:

- *Processing*
- *Management*
- *Storage*
- *Optimization*
- *Dissemination*



Imagery & Remote Sensing

Source Data Management

Feature Extraction / Derivative Generation

Management

Tasking + Collecting → **Processing**

ArcGIS Pro Mesh Modification

MeshModification - Scene1 - ArcGIS Pro

Project | Map | Insert | Analysis | View | Edit | Imagery | Share | Crime Analysis

Clipboard: Paste, Cut, Copy, Copy Path
Navigate: Explore, Bookmarks, Go To XY
Layer: Basemap, Add Data, Add Preset, Add Graphics Layer
Selection: Select, Select By Attributes, Select By Location, Select By Date and Time, Attributes, Clear
Inquiry: Measure, Locate, Infographics, Coordinate Conversion
Labeling: Pause, Lock, View Unplaced, More, Convert
Offline: Download Map, Sync, Remove

Contents

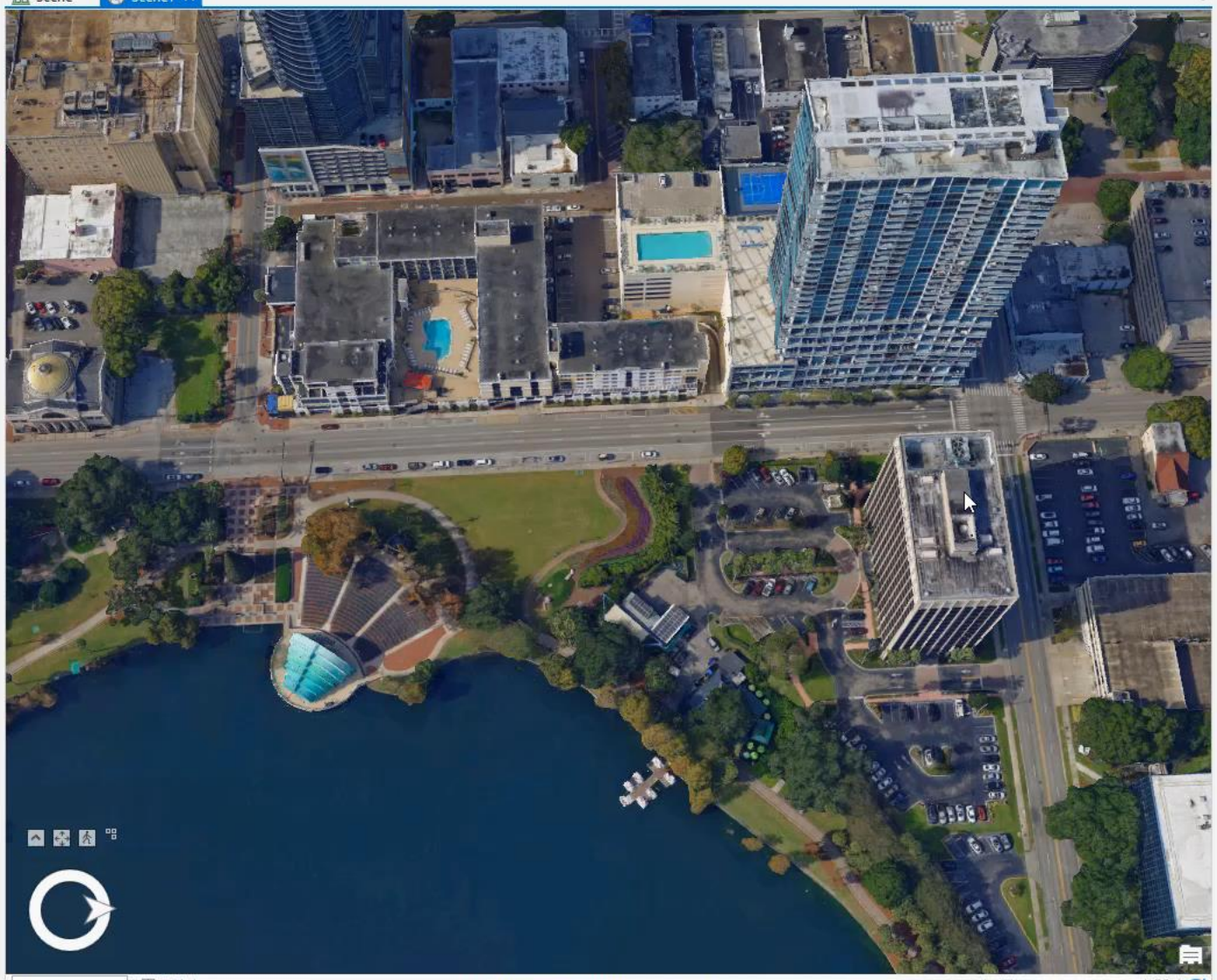
Search

Drawing Order

- Scene1
  - 3D Layers
    - Hotel Area of Interest Mesh
  - 2D Layers
  - Elevation Surfaces
    - Ground
      - WorldElevation3D/Terrain3D

Contents | Tasks

Scene | Scene1



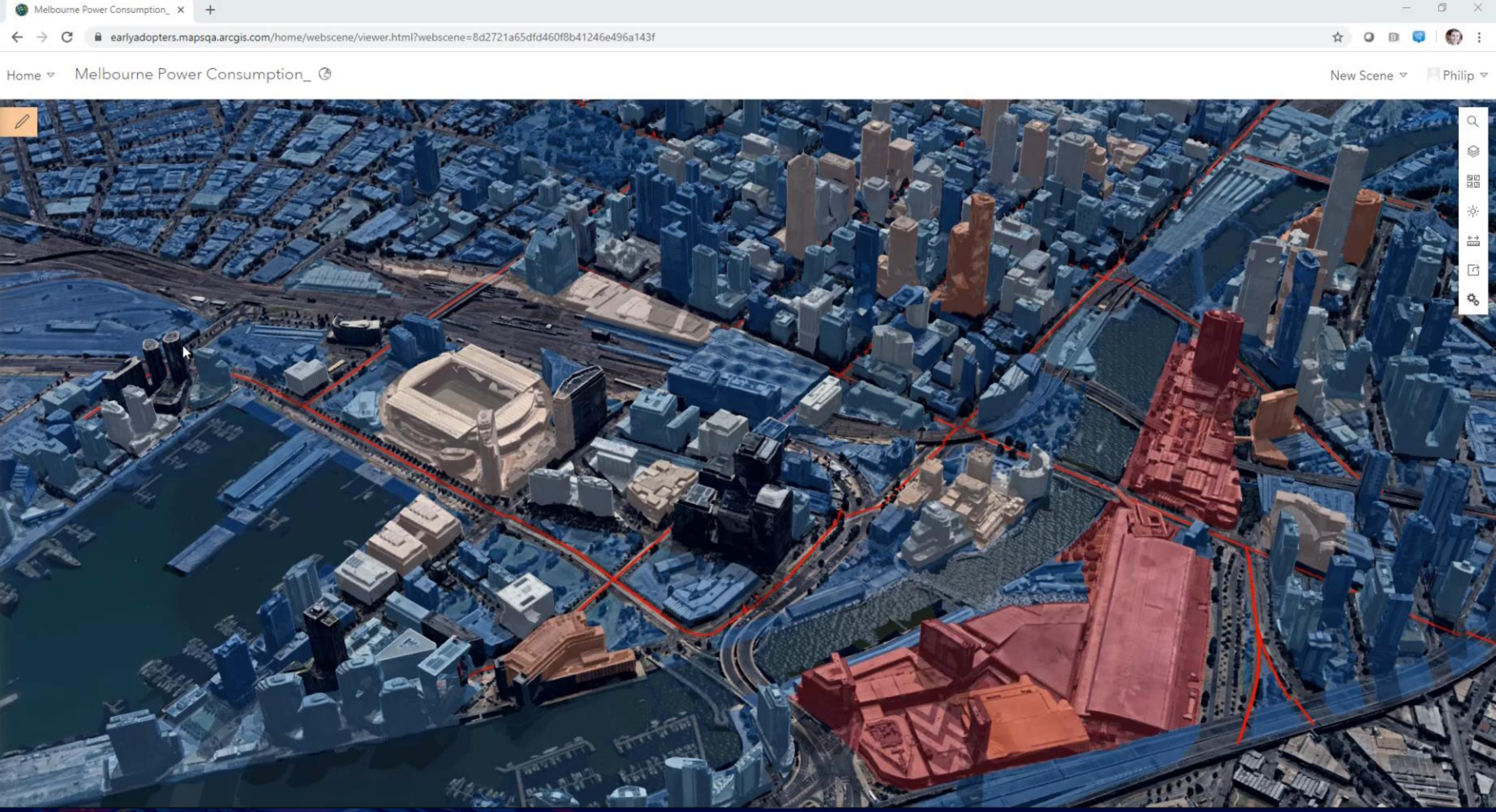
1,378 ft | 81.3764724°W 28.5437600°N | 129.072 ft | Selected Features: 0

Create Features

Search

Templates | Favorites

No editable layers


Melbourne Power Consumption_
earlyadopters.mapsqa.arcgis.com/home/webscene/viewer.html?webscene=8d2721a65dfd460f8b41246e496a143f
Home
Melbourne Power Consumption_
New Scene
Philip

Content Creation, Editing and Data Management

Building Scene Layer

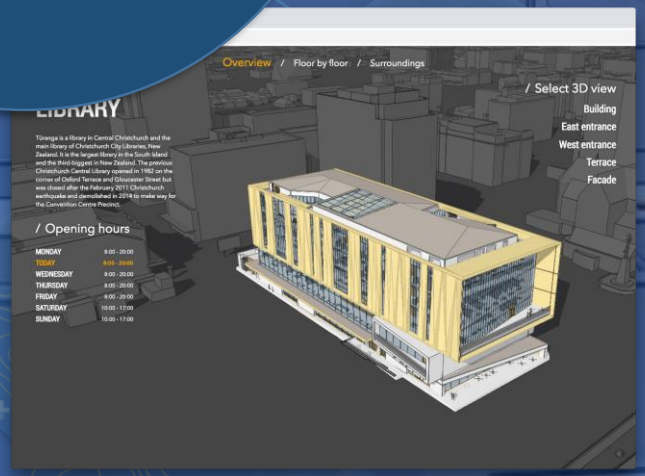
Distributed Collaboration

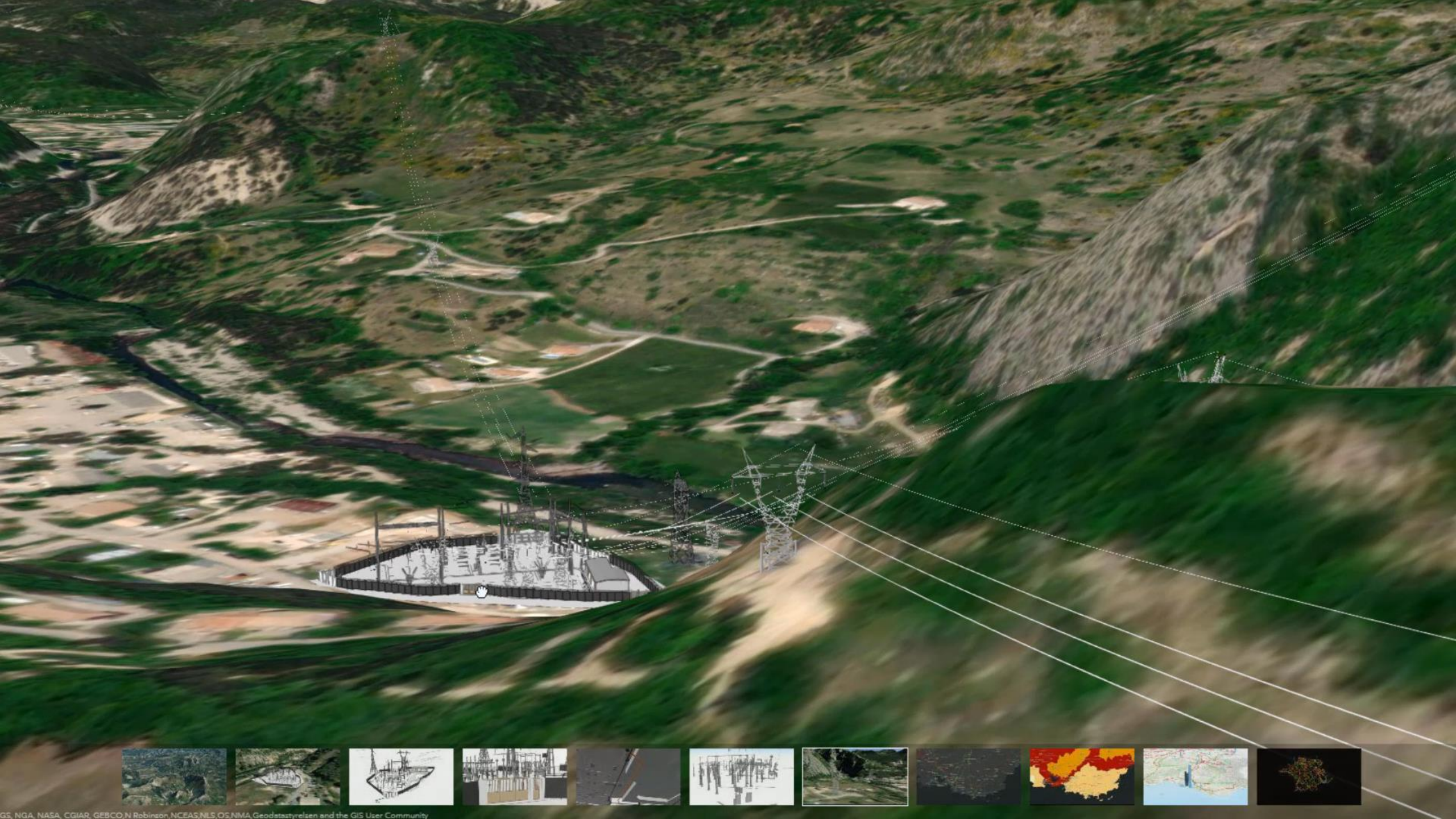
Scene Layers

- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

Content Creation, Editing and Data Management

Feature Layers





GS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NIMA,Geodatastyrelsen and the GIS User Community

Content Creation, Editing and Data Management

Maintain: Scene Layer with Associated Feature Layer

Distributed Collaboration

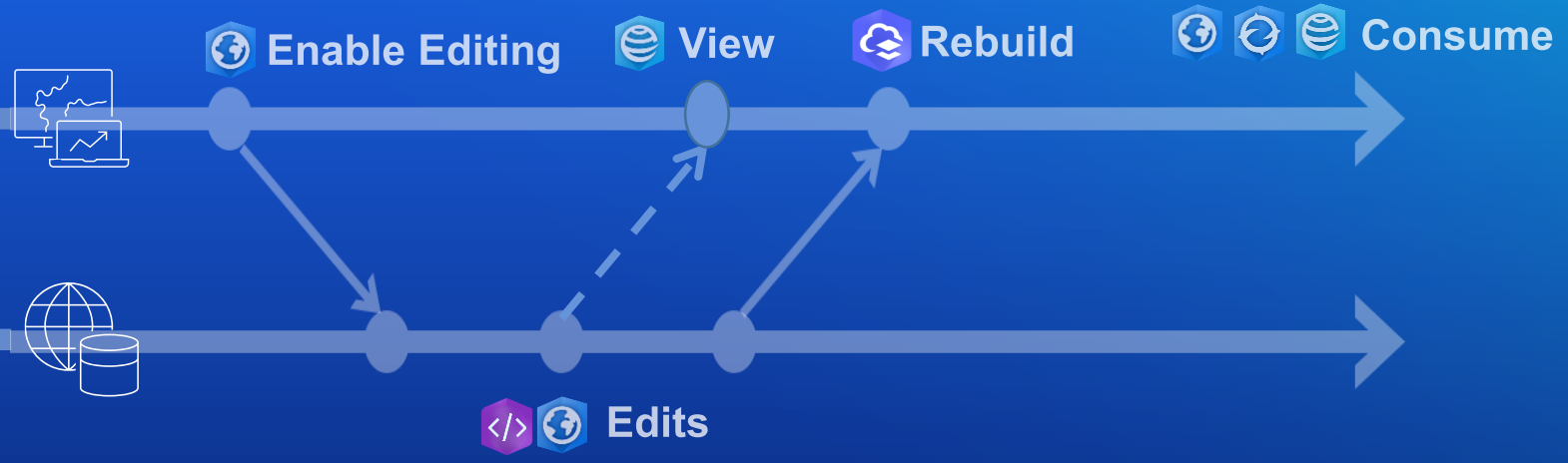
Scene Layer I3S Service

Content Creation, Editing and Data Management

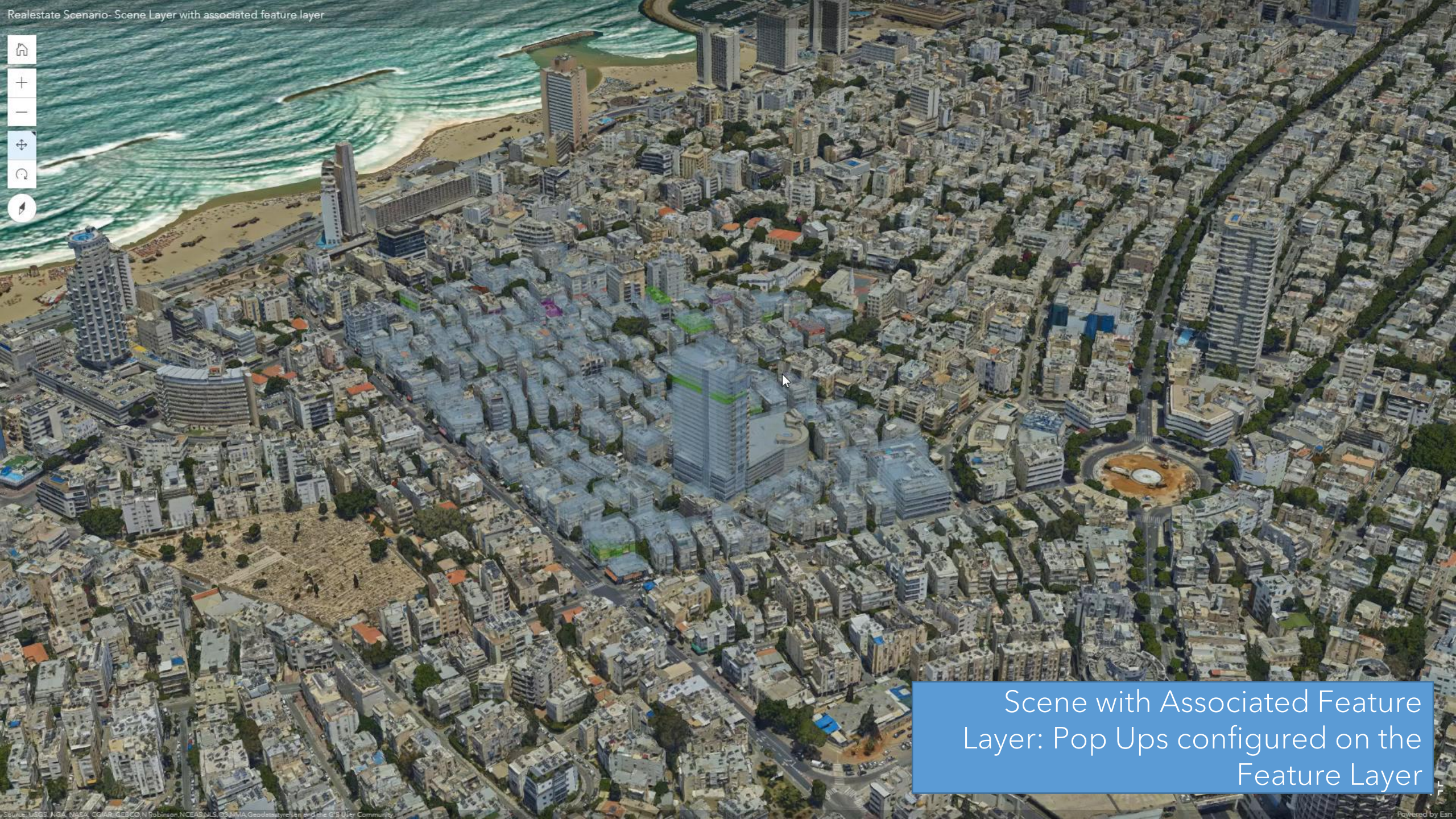
Feature Layer (Editable)

Editing Improvements

Large Uploads and Enterprise Considerations



- **Point, 3D Object and Building scene layer with associated feature layer**
- **Author editable scene layer**
  - **By ref (Enterprise)**
  - **By value**
- **Rebuild Scene Layer Online with Partial Updates (avoiding rebuilding entire Cache**
- **NEW! Scene layer refers to associated feature layer for web-configurable popups and symbology**


Realestate Scenario- Scene Layer with associated feature layer
Scene with Associated Feature Layer: Pop Ups configured on the Feature Layer

Content Creation, Editing and Data Management

Feature Layers: Smart mapping & styling on the web

Distributed Collaboration

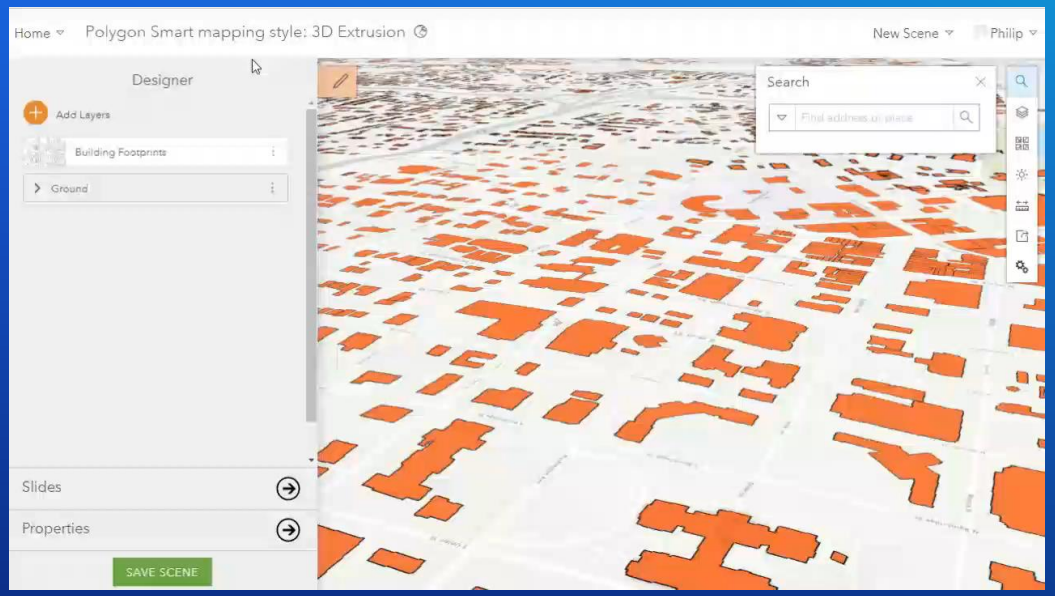
Scene Layers

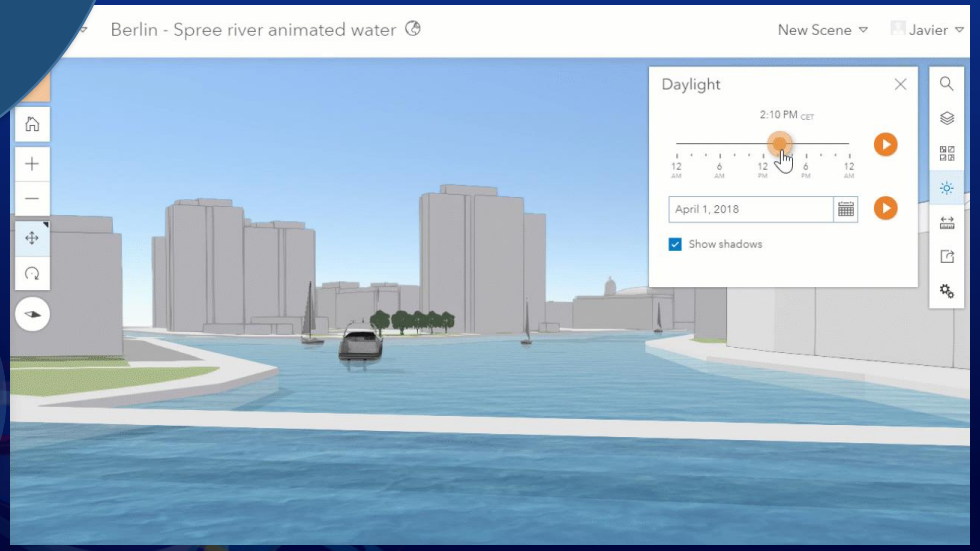
Content Creation, Editing and Data Management

Feature Layers

- Smart mapping
- Real-time
- Web configurable

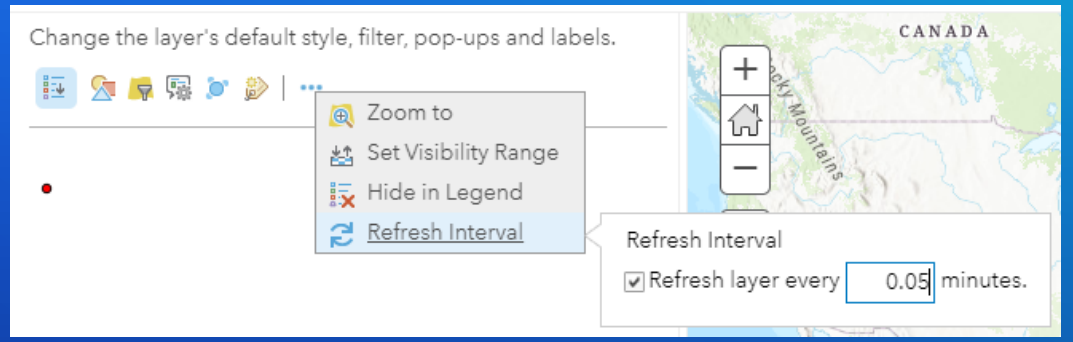
Mobile Scene Packages





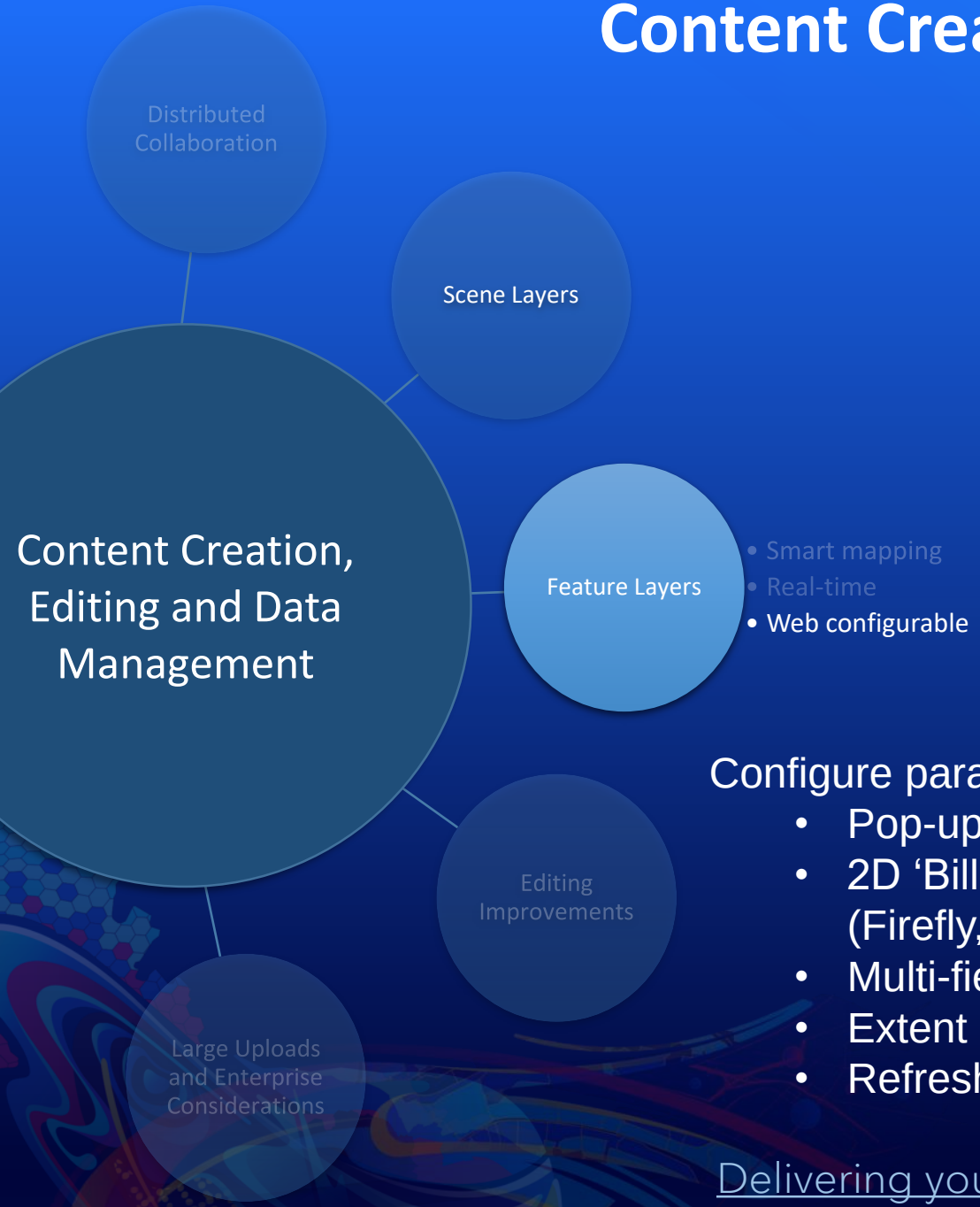
Content Creation, Editing and Data Management

Feature Layers: Real-time

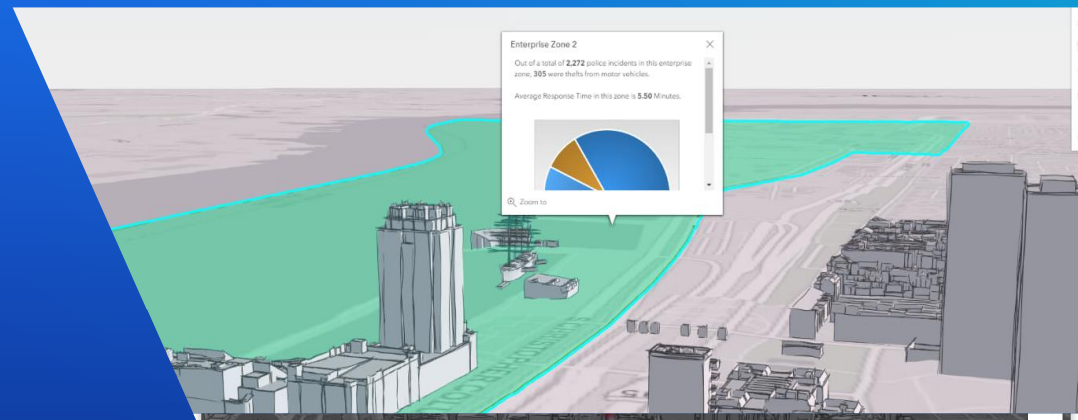


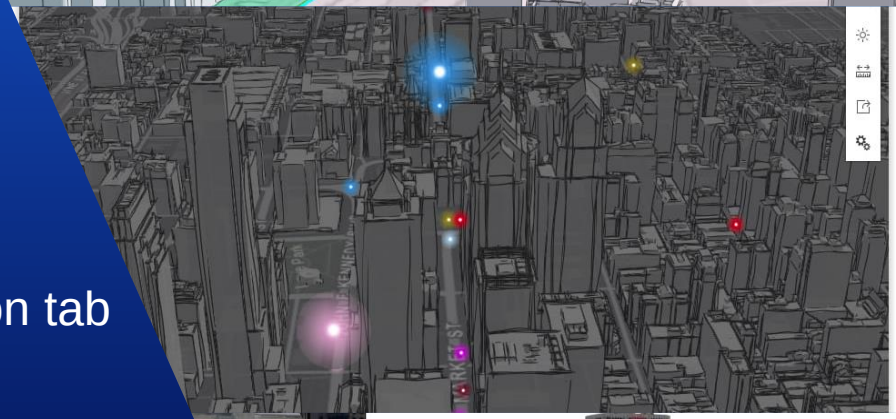
Content Creation, Editing and Data Management

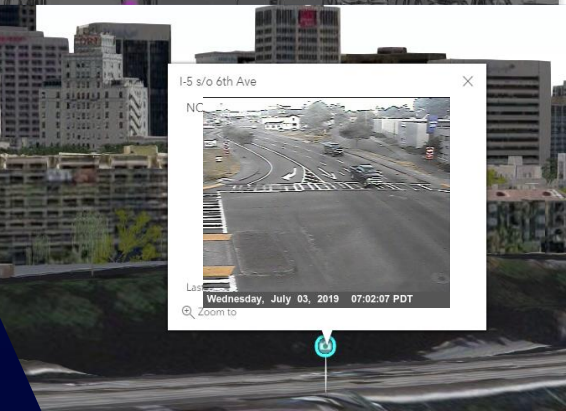
Feature Layers: Web Configurable



- Smart mapping
- Real-time
- Web configurable







Configure parameters in item visualization tab

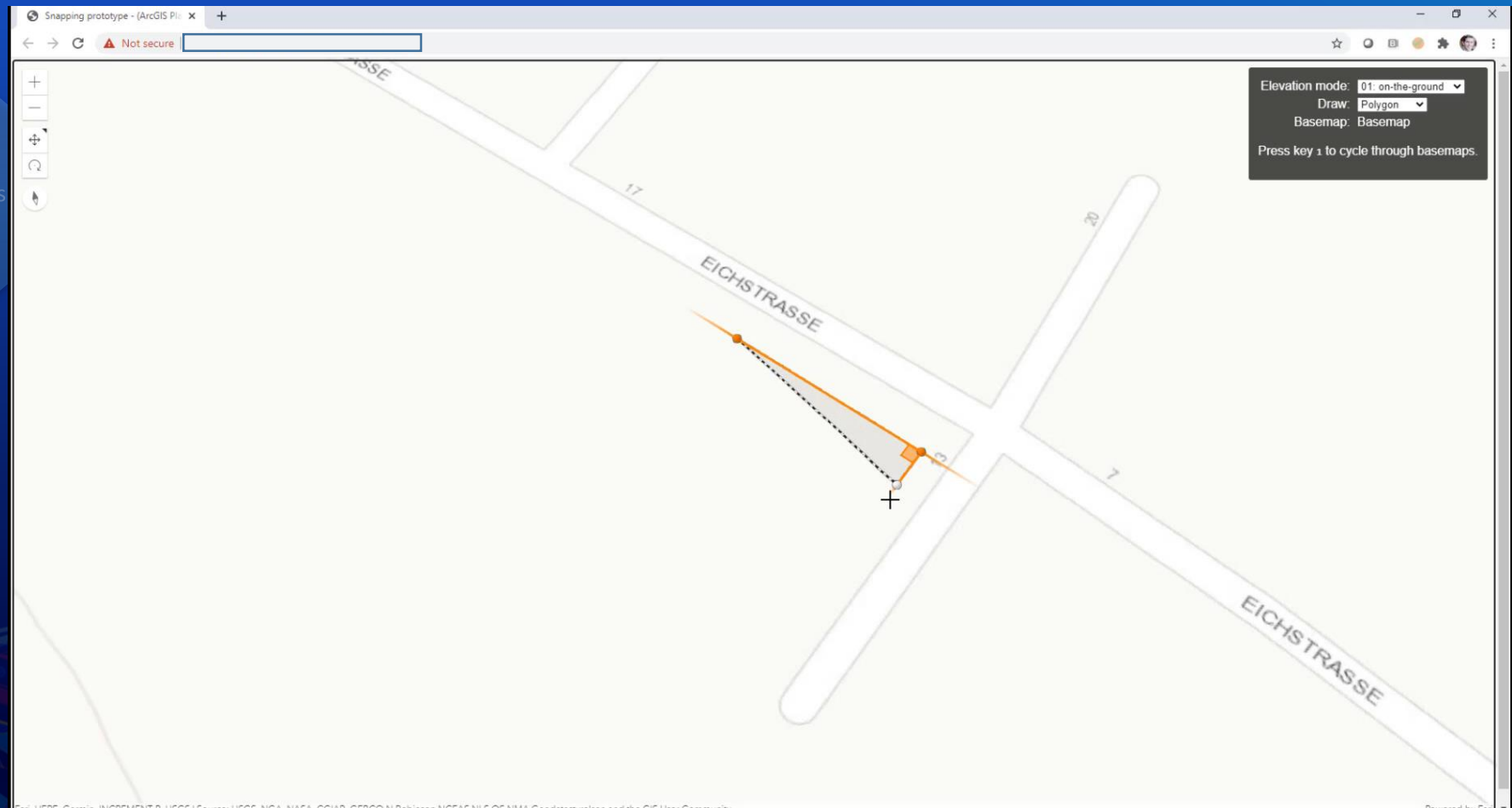
- Pop-ups
- 2D ‘Billboard’ Symbology choices (Firefly, 2D smart mapping)
- Multi-field Filtering
- Extent Filtering
- Refresh Rate

Delivering your Common Operating Picture with 3D

Content Creation, Editing and Data Management

Editing Improvements

In-feature Snapping



Content Creation, Editing and Data Management

Large I3S Uploads and Enterprise Considerations

[You MUST install and configure a Tile cache data store]

What is ArcGIS Data Store?

ArcGIS 10.8 (Windows) | Other versions

ArcGIS Data Store is an application that lets you configure data storage for the hosting server used with your ArcGIS Enterprise portal. If you are not a database expert, ArcGIS Data Store provides you with a convenient setup and configuration experience that creates the following different types of data stores:

- Relational data store–Stores your portal's hosted feature layer data, including hosted feature layers created as output from standard feature analysis tools run in the portal Map Viewer or ArcGIS Pro.
- Tile cache data store–Stores caches for your portal's hosted scene layers.
- Spatiotemporal big data store–Archives real-time observational data from a federated ArcGIS GeoEvent Server site and locations recorded through ArcGIS Tracker. It also stores the results generated using GeoAnalytics Tools run in the portal Map Viewer or ArcGIS Pro and stores missions and locations for ArcGIS Mission.

ArcGIS Enterprise

What's New in ArcGIS Enterprise 10.8.1: Publishing large scene layers in a snap

3D Visualization & Analytics
July 28, 2020

Garima Tiwari

ArcGIS Enterprise supports a very simple publishing workflow for scene layers; simply upload your scene layer package (slpk) as an item and click publish. ArcGIS Enterprise takes care of the rest. However, if you have very large slpks with GBs or more content, the publishing process could become time-consuming and disk resource intensive.

ArcGIS Enterprise 10.8.1 provides an alternative publishing workflow, specifically designed for those of you who need to publish ginormous amounts of data.

Scene layers that reference content in folder or cloud data stores

ArcGIS

Products supporting 3D workflows

ArcGIS Pro

Enhancements to exploratory analysis and editing

Learn more: youtu.be/rQkKIPFq2tg

Exploratory analysis tools

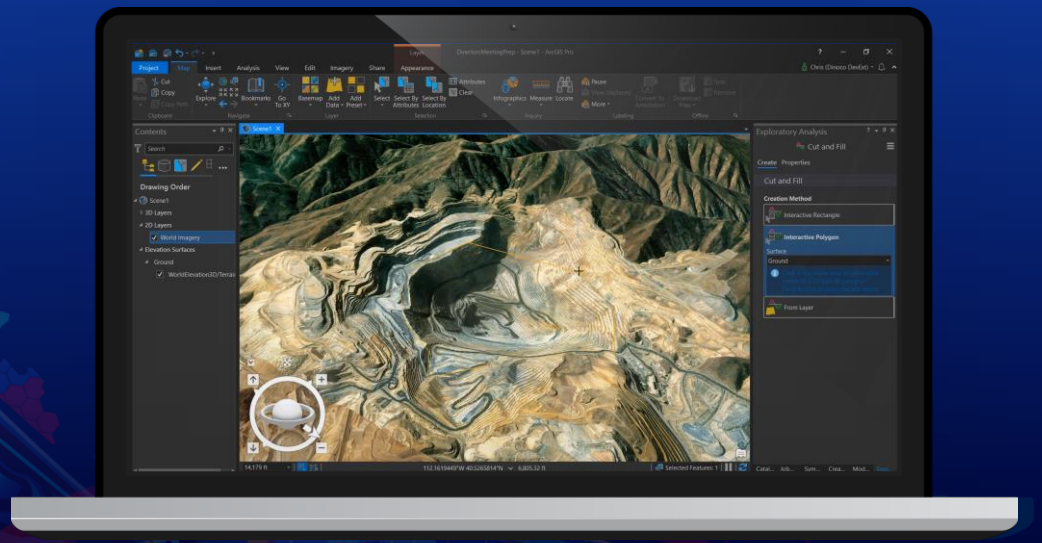
Line of sight, viewshed, view dome, and slice by plane or volume capability can be applied to visible scene layers.

New: Cut-Fill Tool

3D editing / modeling

Directly edit OBJ, DAE, multipatch features (geodatabase) and scene layers with new precision editing tools.

New: Explode, Merge and Slice Multipatch



Realistic Visualizations

Ambient Occlusion, Eye-dome lighting, Material support in Markers, Water fill symbol

3D object scene layer symbology

Smart mapping functionality to stylize 3D layers (similar to web scene viewer)

Animation for static and dynamic story telling

Create rich animations with 3D content and screen overlays for text and imagery content that can configured with timing settings.

LAS Classification

Classify building rooftops, ground and vegetation Lidar. New Profile viewing helps manually classify lidar.

Esri CityEngine

Enhancements to drawing tools and exploratory analysis

Learn more: bit.ly/CE20181

Instant quantitative visibility assessments

Detailed statistics have been added to viewshed and view dome tools that quantify visibility qualities as inputs to assessment valuation models.

glTF import and export

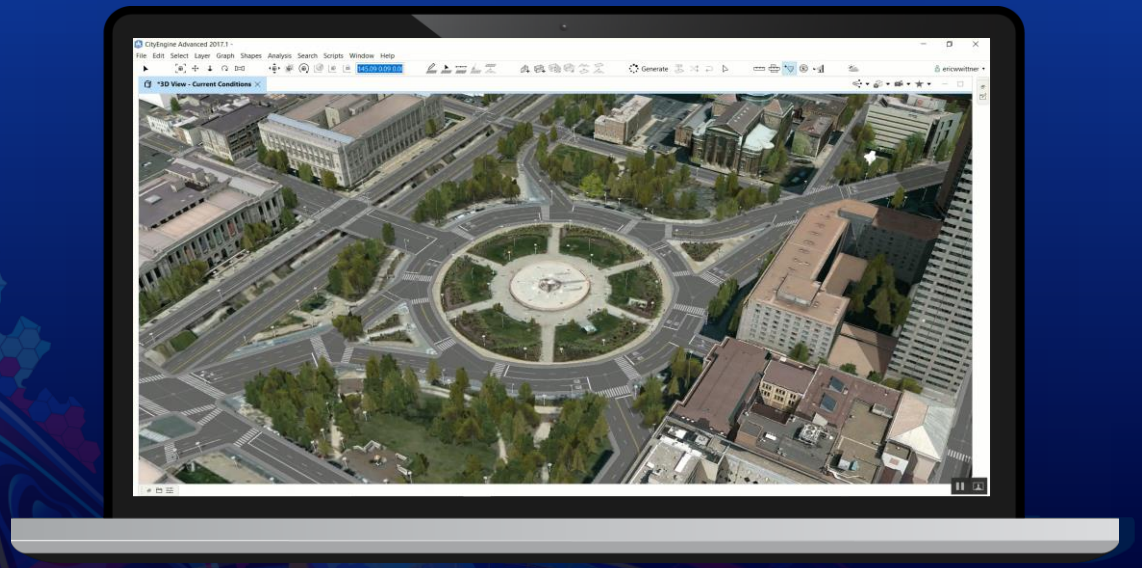
New import and export functionality for glTF 2.0 which also supports physically based materials.

Web publishing of elevation data

Export a terrain layer as an elevation tile package (TPK, with LERC compression), that you can merge with Esri's world elevation surface.

CGA Operations for Urban Design

Clean up inaccurate building footprints, control setback distances and enable better encoding of urban design practices.



CityEngine plugin for Houdini

3D environment artists do not have to leave their Houdini toolset anymore to make use of CityEngine.

Premium VR experience for urban planning reviews

Two new templates for Unreal engine, for real-time visualizations and intuitive table-top experience.

Scene Viewer

Enhancements to search, navigation, and rendering

Learn more: bit.ly/WSV2018-3

Try it out: arcg.is/yTSCe

Animated Water Visualizations

Water styles applied to polygon feature layers will add animated waves to your features representing the surface of oceans, lakes, rivers or pools.

Large Feature Datasets

Point, lines and polygon feature layers with thousands or even millions of feature layers can be added to a scene.

Smart mapping line and polygon styles

Lines and Polygons have new smart mapping styles to explore and visualize attribute data. Extrude buildings and make realistic utilities.

Floor Picker and Construction Phase Building Explorer

Isolate building levels and construction phases to display spaces, structural assets and infrastructure.

Search for features in web scenes

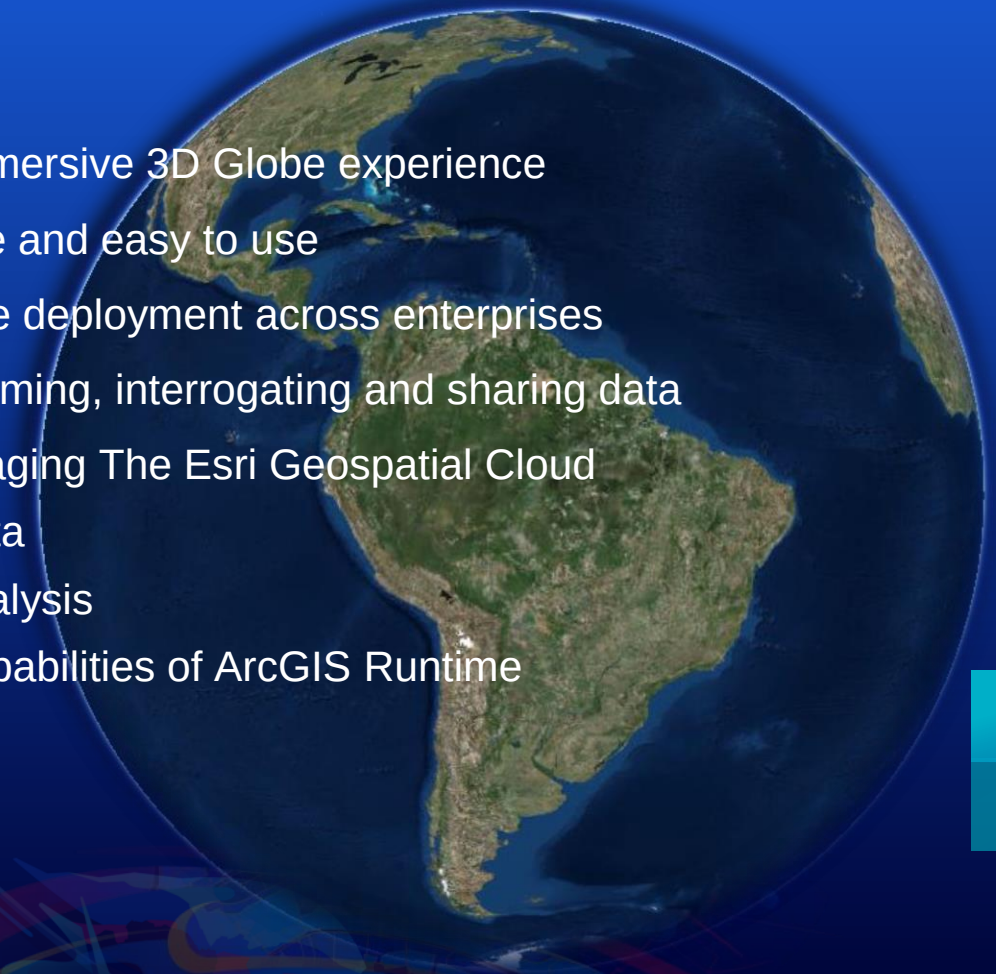
Users can configure feature search in a scene and locate objects by attributed information. Including Building Scene Layers

Improved Underground Navigation

Explore subsurface geology and infrastructure with underground navigation.

ArcGIS Earth | Lightweight, easy-to-use interface for immersive 3D

Supporting more than just KML and legacy file based workflows…



- An immersive 3D Globe experience
- Simple and easy to use
- Secure deployment across enterprises
- Consuming, interrogating and sharing data
- Leveraging The Esri Geospatial Cloud
  - Data
  - Analysis
  - Capabilities of ArcGIS Runtime

Visualize
Add multiple data types
Access data Online, Enterprise, Locally or via URL
Perform interactive

Explore
Search the globe
Easily switch basemaps and terrain

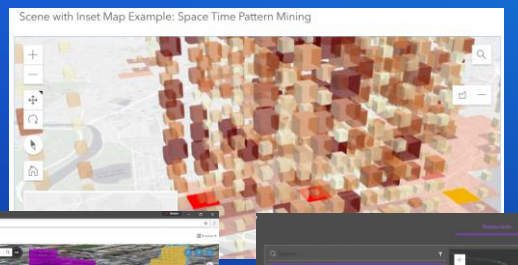
Share
Save out KMZ
Share between mobile and desktop

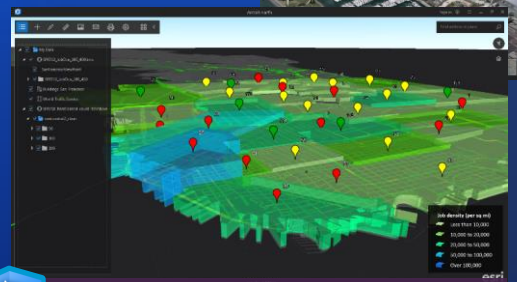
Stakeholders

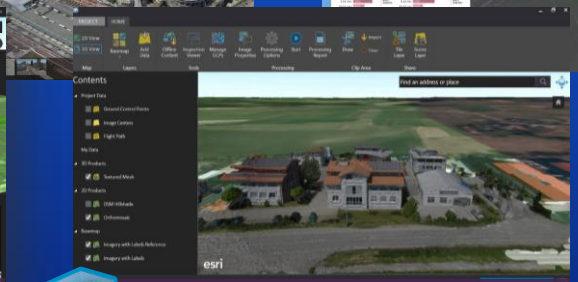
- Government, Education, Architecture, Engineering, Construction, Natural Resources

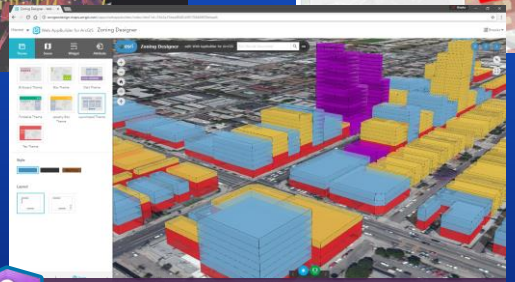
Interactive Analysis, Automation API, KML editing and more

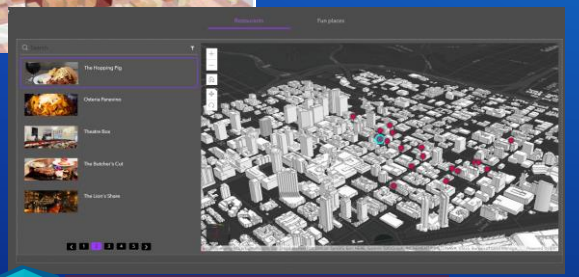
Apps | 3D Tools For The Field, Office, and Community







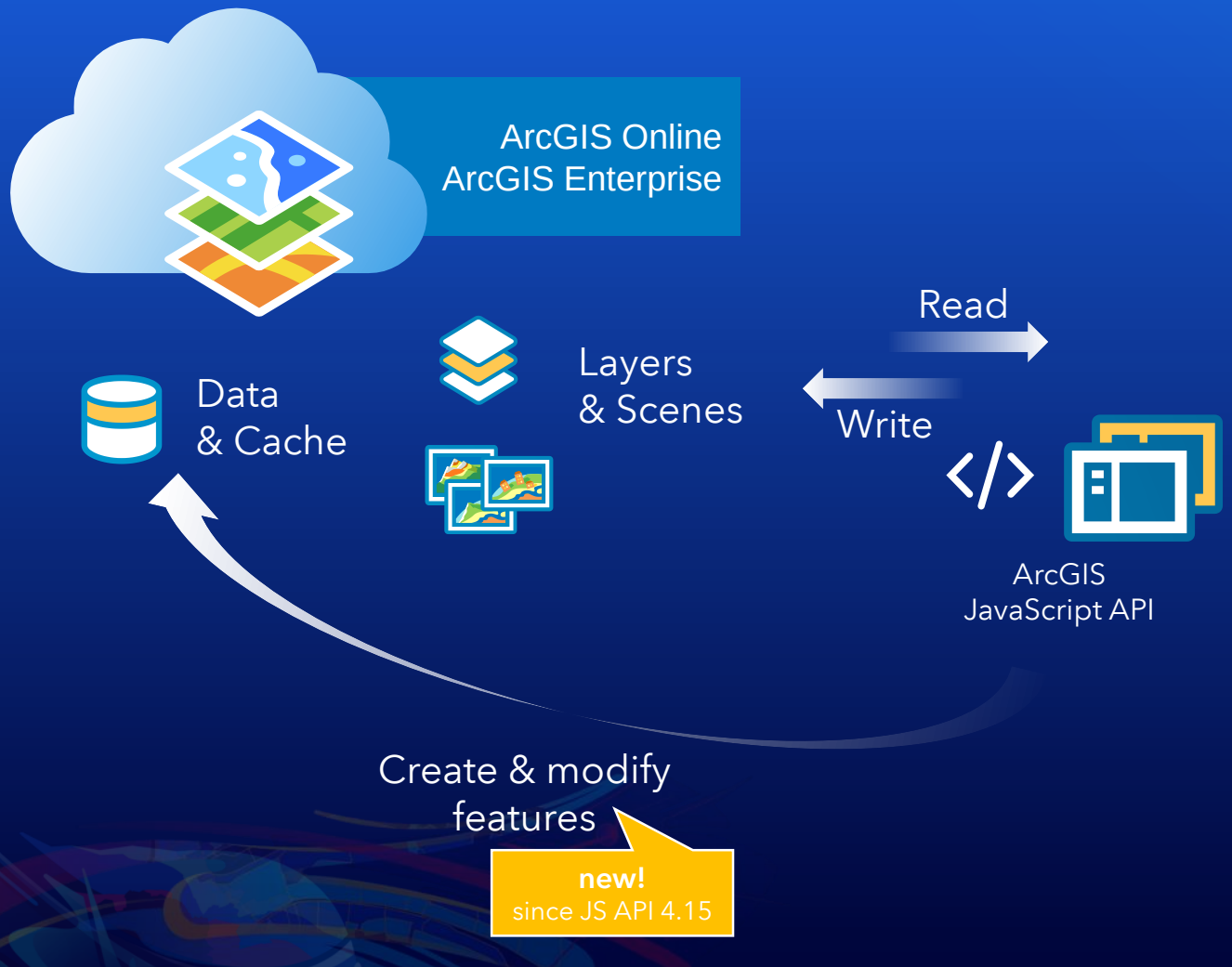




ArcGIS Earth | Drone2Map | Web AppBuilder | Experience Builder

ArcGIS Earth	Easy-to-use 3D data exploration- Mobile Version
Drone2Map	Streamline the creation of professional imagery products from drones
Web Scene Viewer	View 3D maps in any standard web browser
Web AppBuilder	Build powerful 3D GIS apps without writing a single line of code
App Templates	Compare scenes or include an inset web map with a scene
StoryMaps	Combine 3D maps with narrative text, images, and multimedia content
Experience Builder	Interact with 2D and 3D content through drag-and-drop widgets

Authoring & Consumption



3D Web Apps

ready to use

Scene Viewer

- explore
- analyze
- author
- share

configurable

Story Maps

Experience Builder

Web AppBuilder

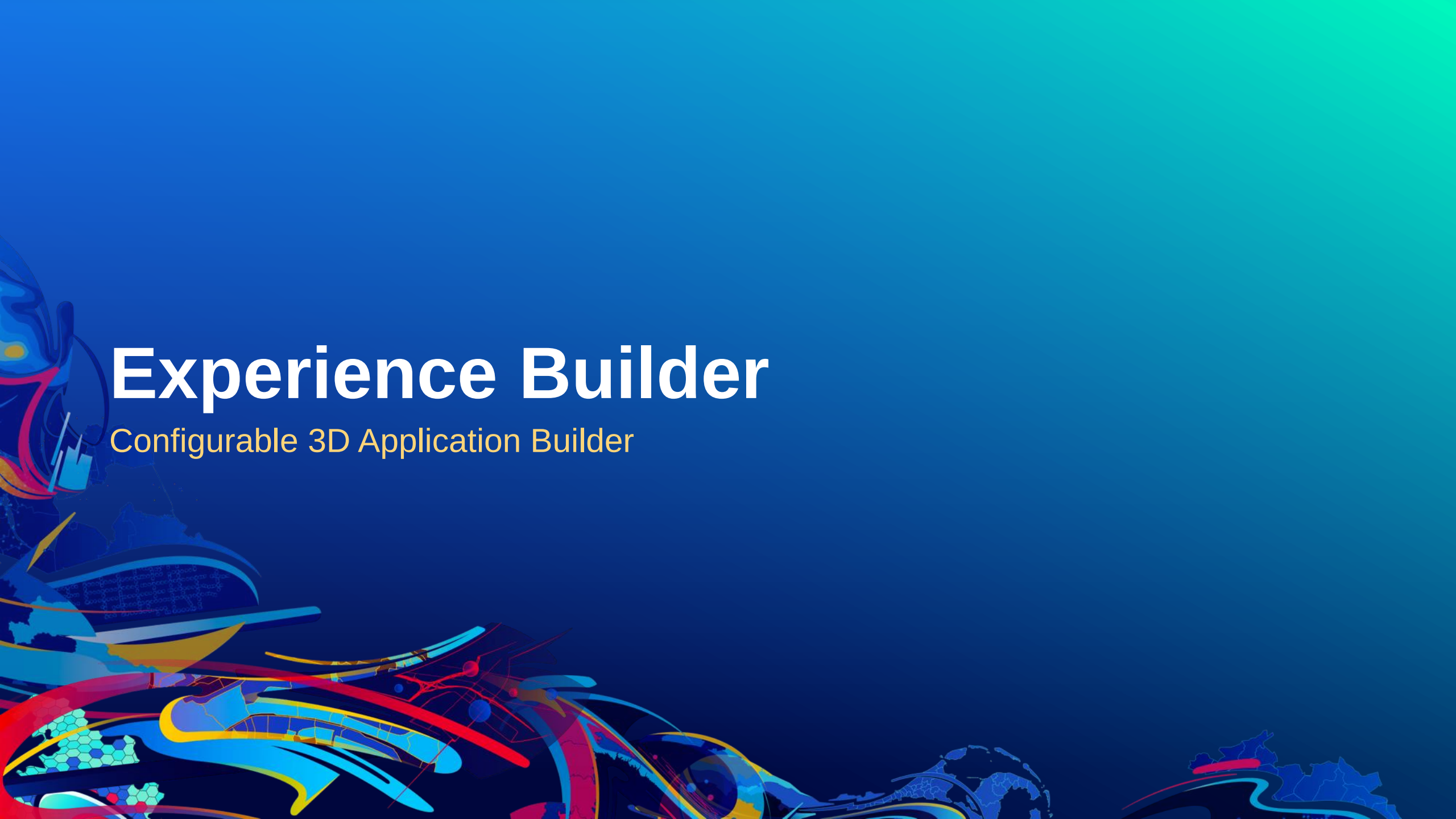
custom code

… your own App!

Airside
Cargo Areas
New Aircraft
BIM Model
Interior Spaces
A13
Maxar, Microsoft | Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community | Esri, ATL
Powered by Esri

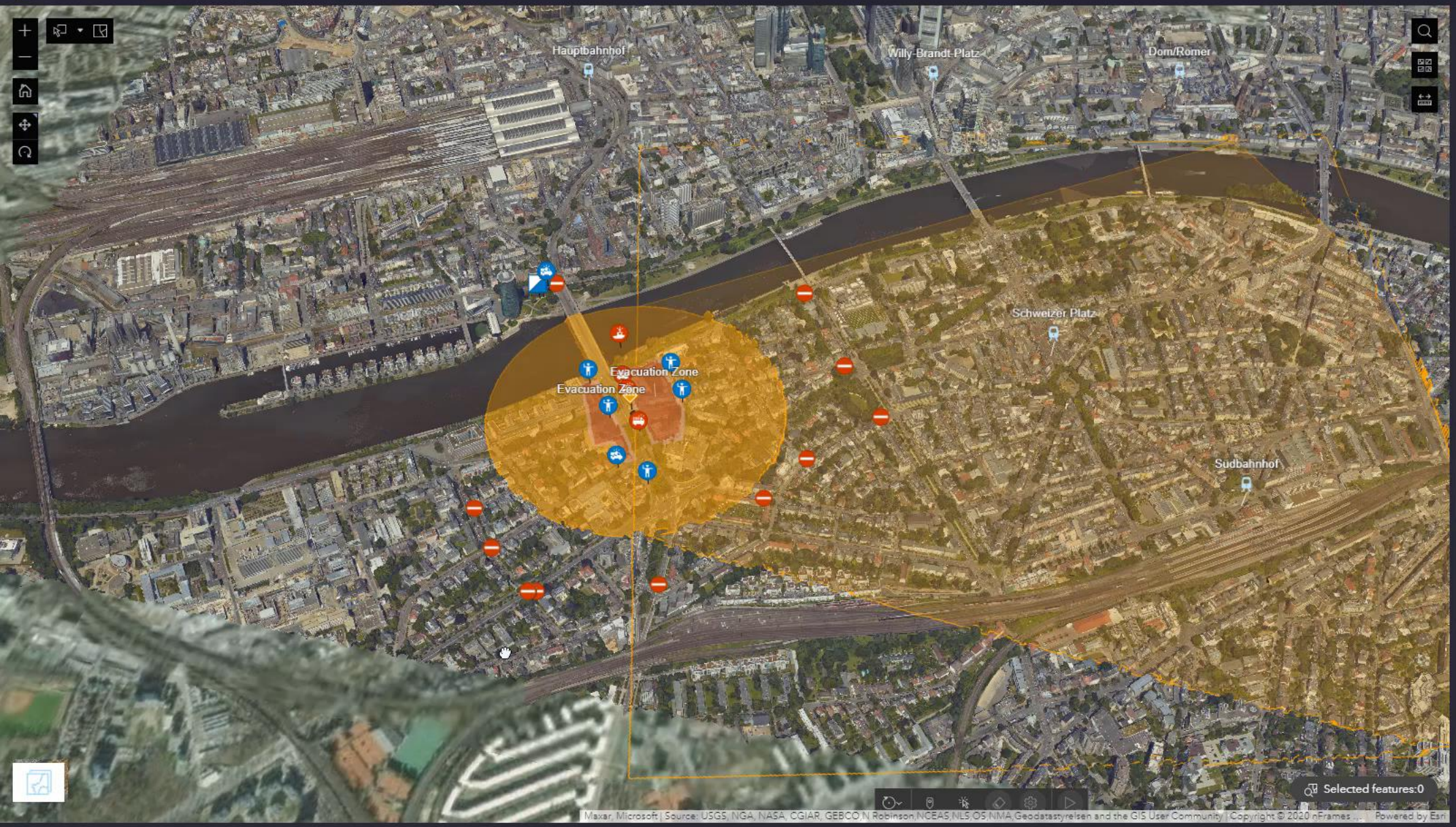
Experience Builder

Configurable 3D Application Builder



Diesel Spill Response

(Demo only)



POC

Fire Boat
Walter Pols
876-399-2395

On Foot
Thom Cordellia
898-343-3456

On Foot
Sam Waller
876-3433

Ambulance
Julie Conner
876-234-3423

On Foot
John Miller
878-543-2311

On Foot
Ivonne Nulty
876-345-2345

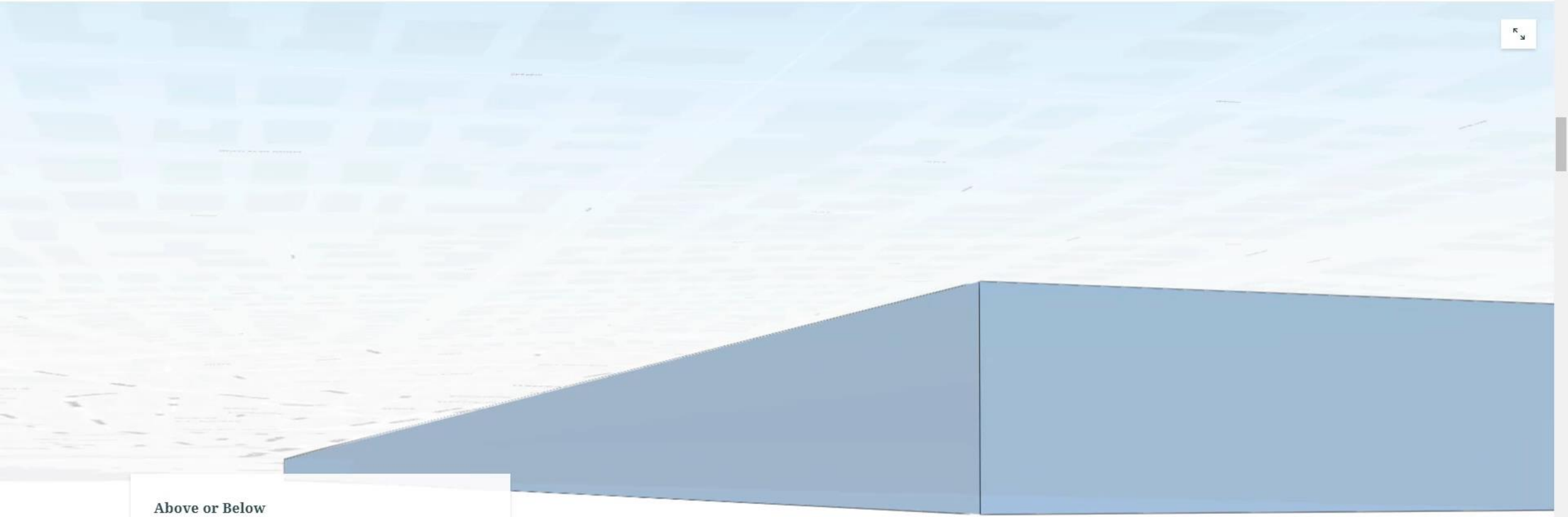
On Foot
Dave Moss
876-233-1236

Command Post

Copyright info

Story Maps

Include Scenes in your Narrative



Above or Below

Features can be extruded above or below ground.

Adding a basemap keeps context for the feature.

Esri Community Maps Contributors, Esri, HERE, Garmin, METI/NASA, USGS | Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

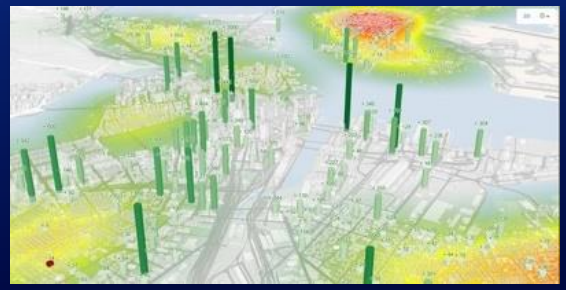
Powered by Esri

ArcGIS Urban

Orchestrate Urban Development and Planning Workflows

Track and Evaluate Projects

Create Planning Scenarios

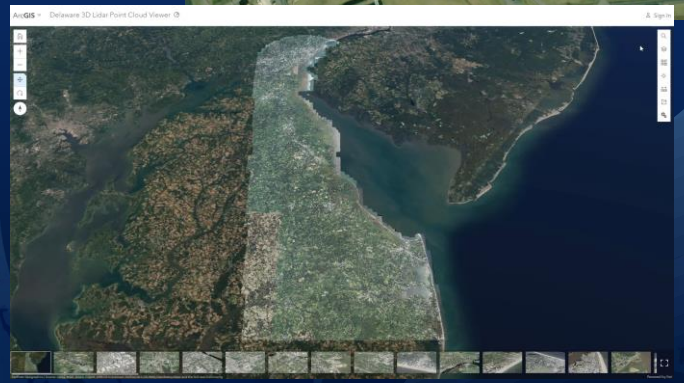


Report and Engage

Stakeholders

- Government
- A/E/C
- Real Estate
- Citizens

What's coming next for 3D at Esri



Recent/near term

- Snapping in Scene Viewer
- Improved Navigation with subsurface/free space scenes*
- Elevation Profile Tool
- Search Building Scene Layer
- Scene Viewer support for WKT CS & Mars CS
- Faster voxel display*
- Recook and reproject integrated mesh scene layers
- I3S SDK with Mesh LOD generation*
- ArcGIS Maps SDK for Unity and Unreal Engine
- nFrames SURE reality capture acquisition*

Mid term

- 3D Editing in Scene Viewer*
- ArcGIS Earth write to services
- Configurable App Templates:
  - Simple Viewer, Compare, Scene w/ Inset Map
- Savable Scene Layer symbology/configuration*
- Integrated mesh attributes
- Clip and ship workflow for meshes
- Composite scene layer
- Cloud file storage publishing for scene layers
- Open Street Map-derived buildings global scene layers
- 3D Object Feature Layer*
- CesiumJS reading I3S

Long term

- 3D Support in Dashboards
- 3D Widgets in Experience Builder (LOS, Profile, Summarization graphs, Slice)
- Time-enablement/Time Slider in web scenes*
- Support for material properties
- Voxel Scene Layer for web sharing*
- GP support for mesh and point cloud scene layers
- Point Cloud data management for Scene Layers
- ArcGIS Earth API*

Plans subject to change

Copyright © 2021 Esri. All rights reserved.

Please provide your feedback for this session by clicking on the session survey link directly below the video.