3D Across ArcGIS

Philip Mielke, Stephen Heidelberg, Ivonne Seler

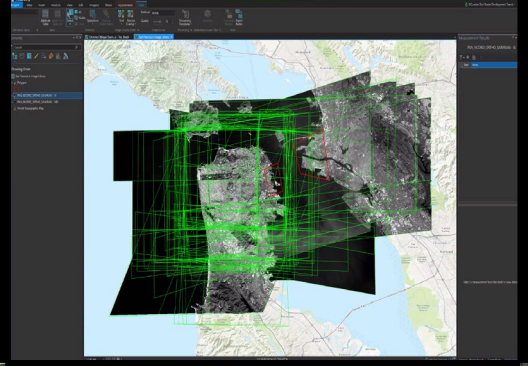


2021 ESRI USER CONFERENCE

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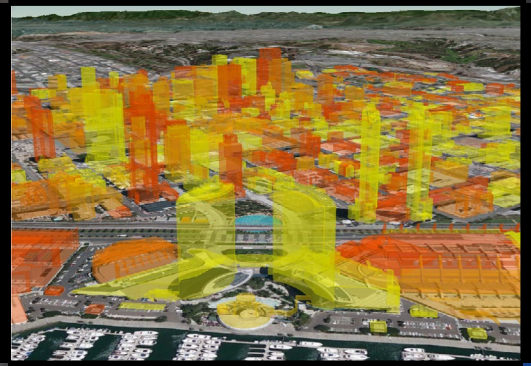
Lidar



Oblique photogrammetry



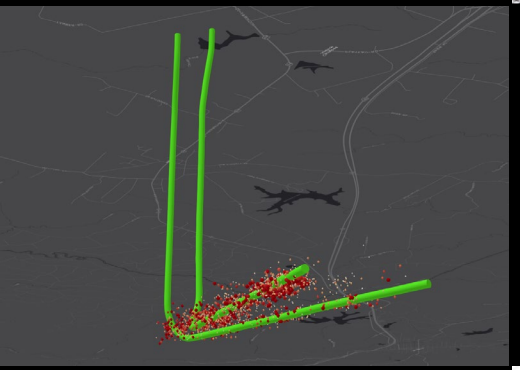
BIM



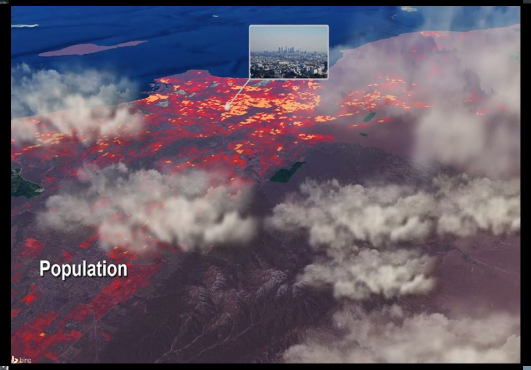
Indoor & subsurface scanning



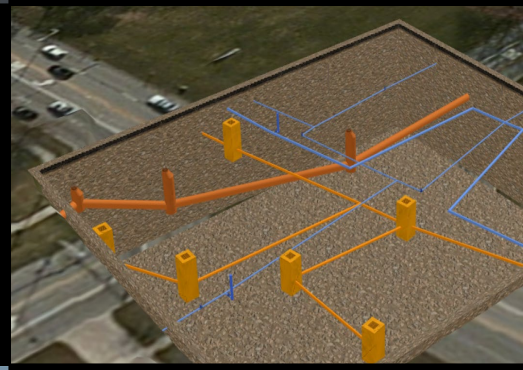
Real-time (4D)



IoT



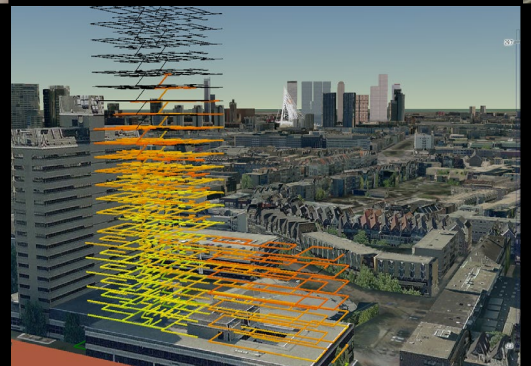
Textured Meshes



FMV

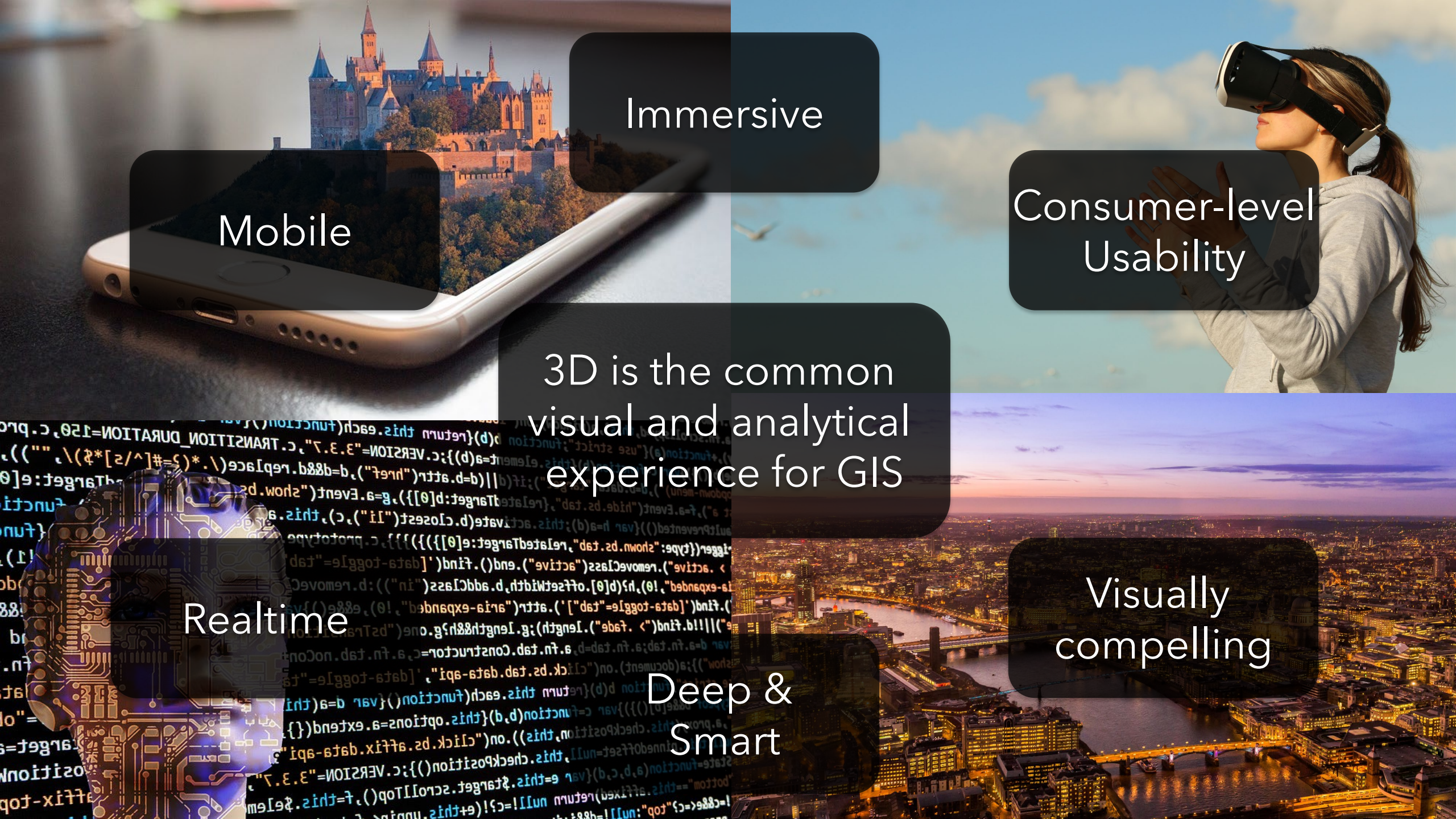


Spherical & panoramic imagery



UAV


Data availability is driving
demand for new experiences

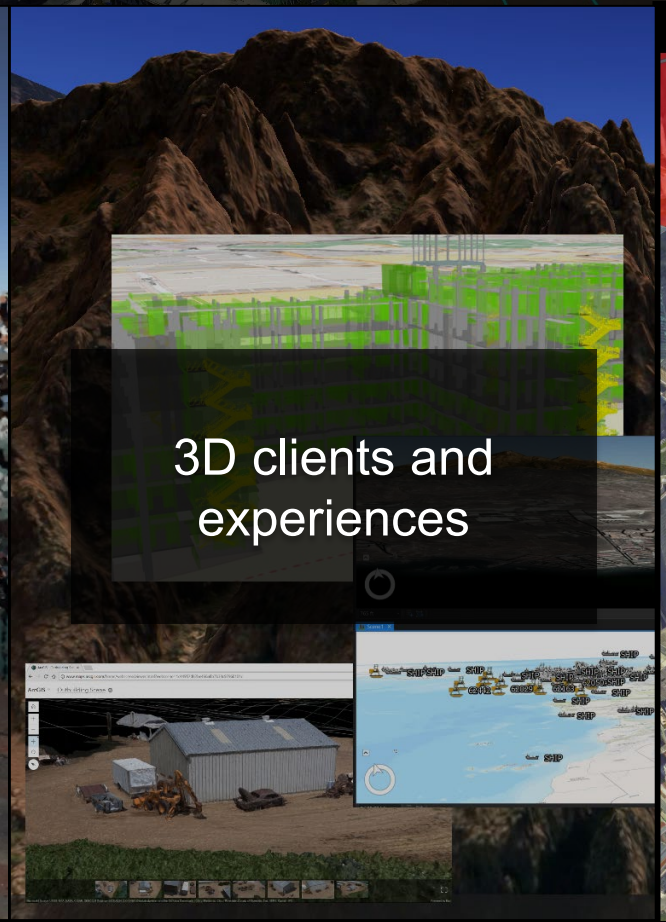

Immersive
Mobile
Consumer-level Usability
3D is the common visual and analytical experience for GIS
Realtime
Visually compelling
Deep & Smart


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

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

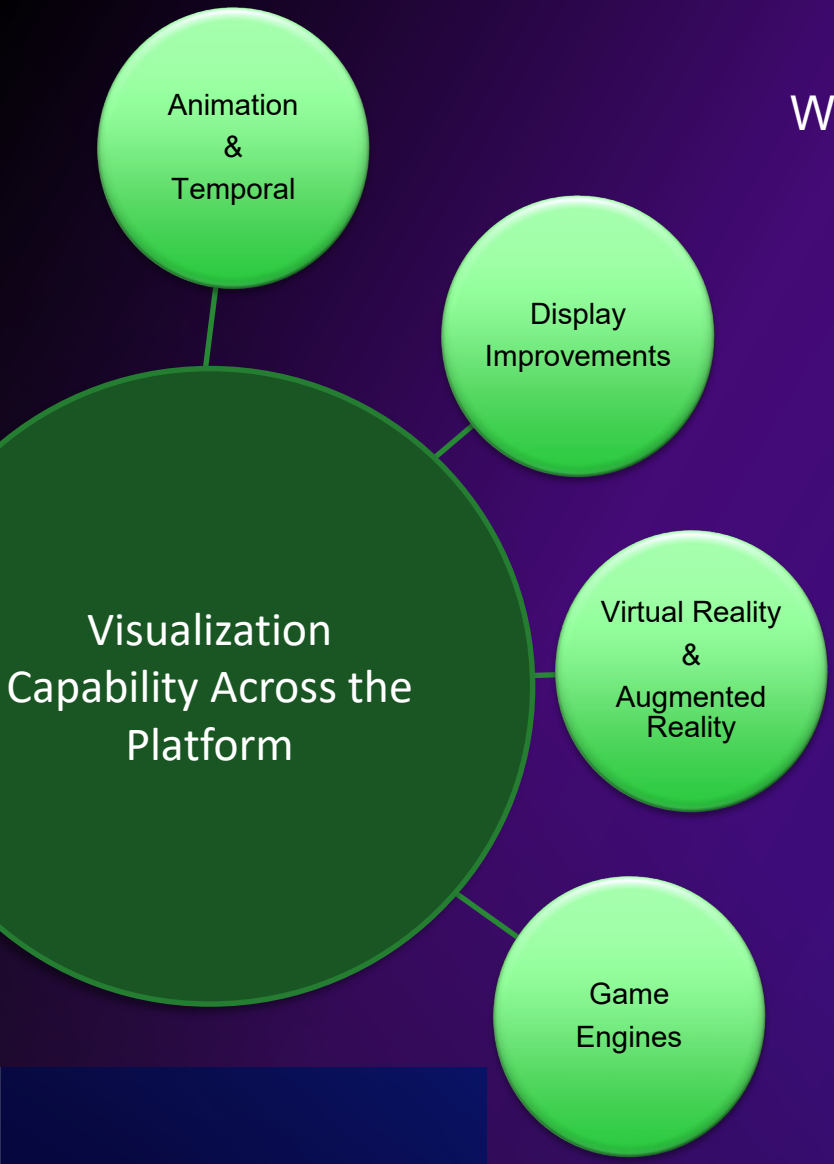
ArcGIS

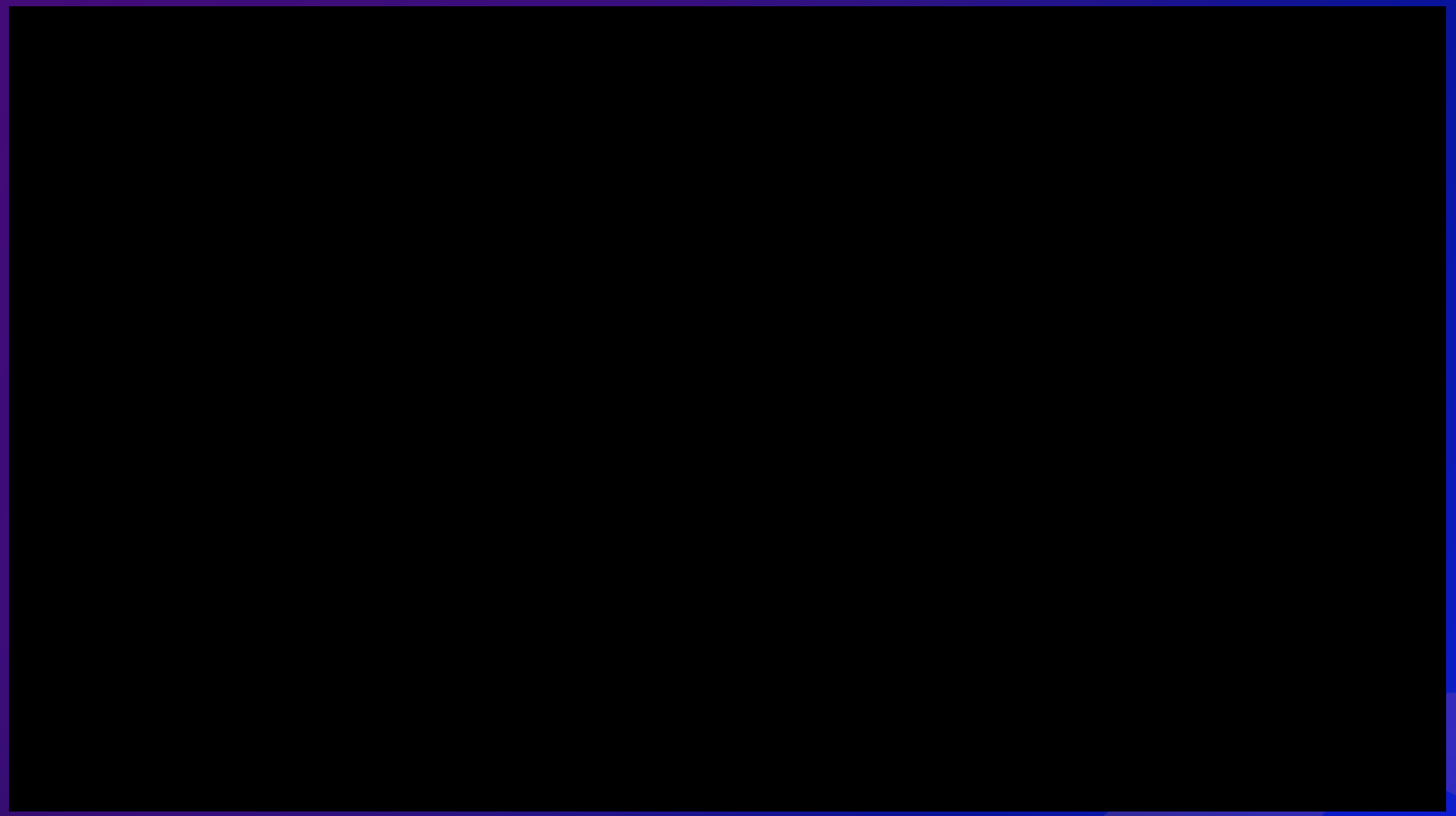
Visualization Capabilities



ArcGIS Visualization Capabilities

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





Enhanced Visual Aesthetics

How things look is important…

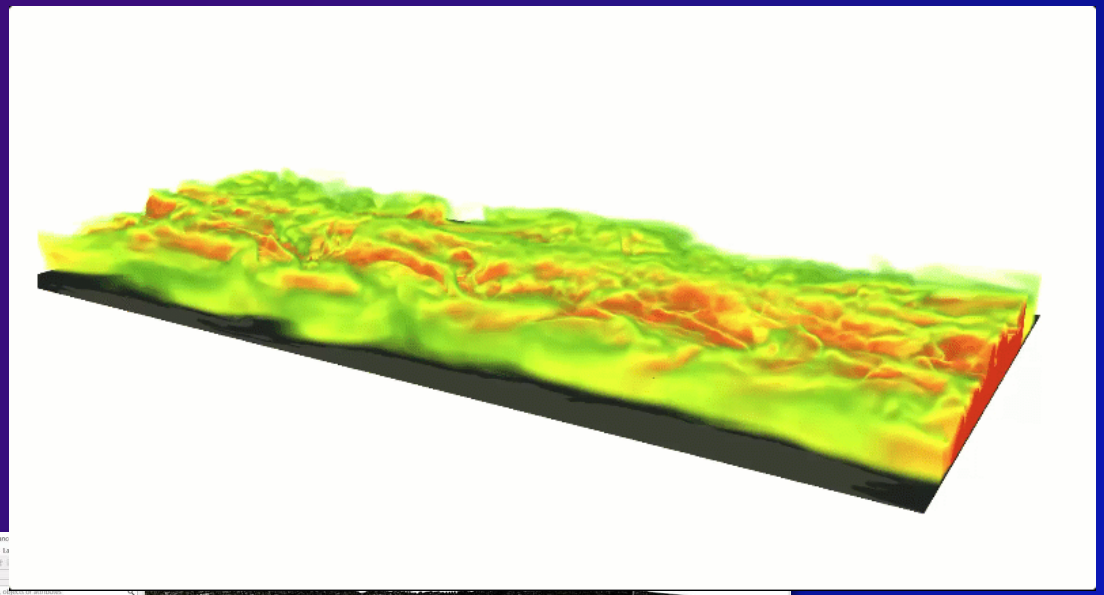
Visualization Capability Across the Platform

Animation & Temporal

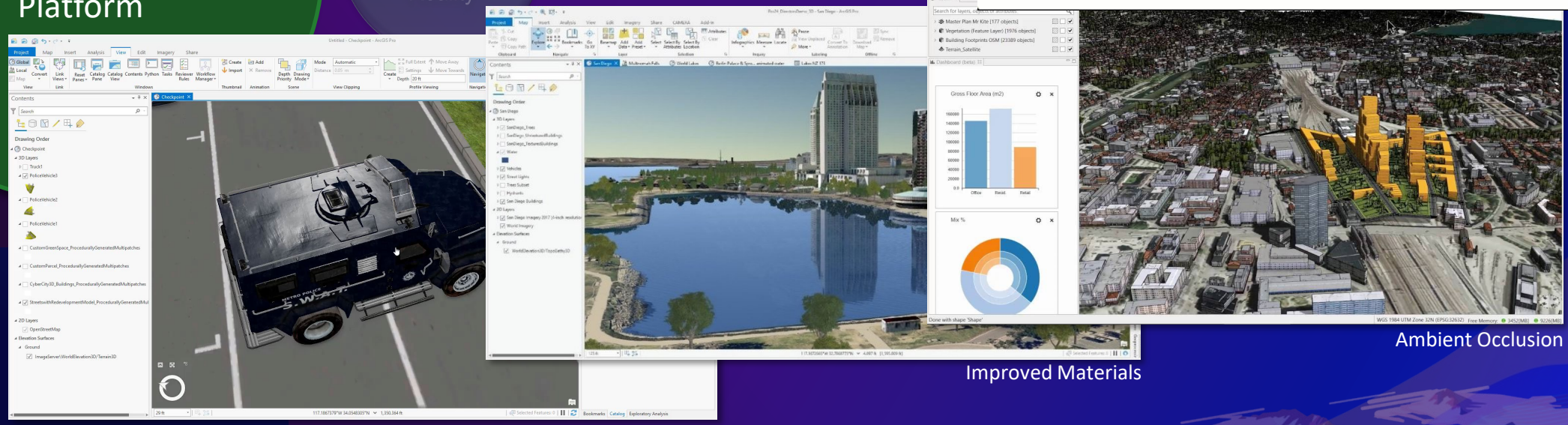
Display Improvements

Virtual Reality & Augmented Reality

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



Voxel Rendering



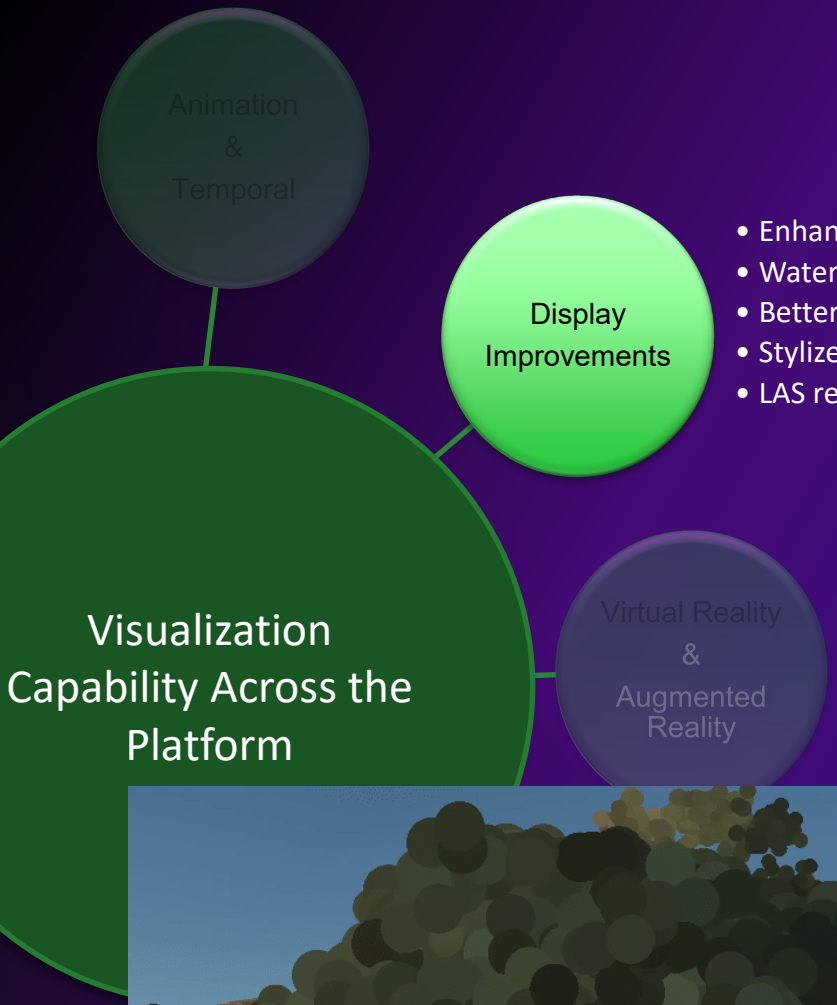
Ambient Occlusion

Improved Materials

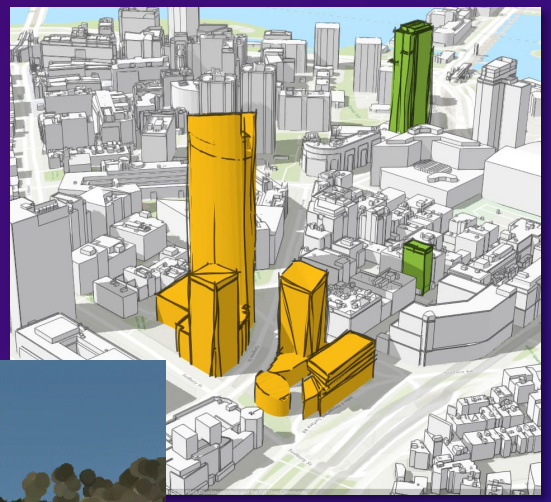
glTF

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.)



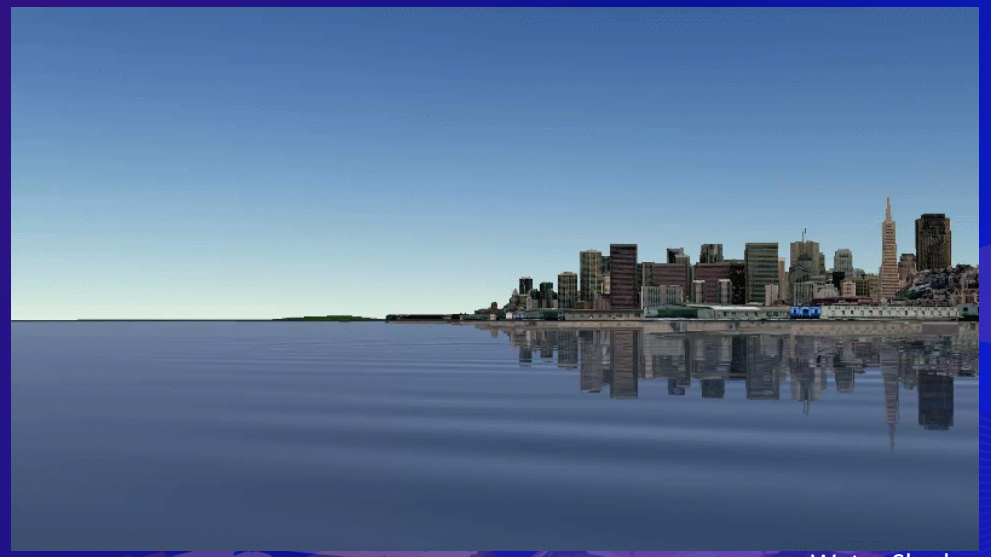
Sketch Edges



Rich 2D & 3D Symbology



Colorize LAS



Water Shader

Game Engine Integration

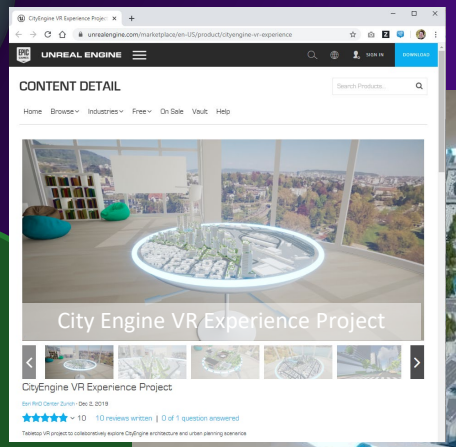
We are building tools & connections to make using game engines easier for you.

Animation & Temporal

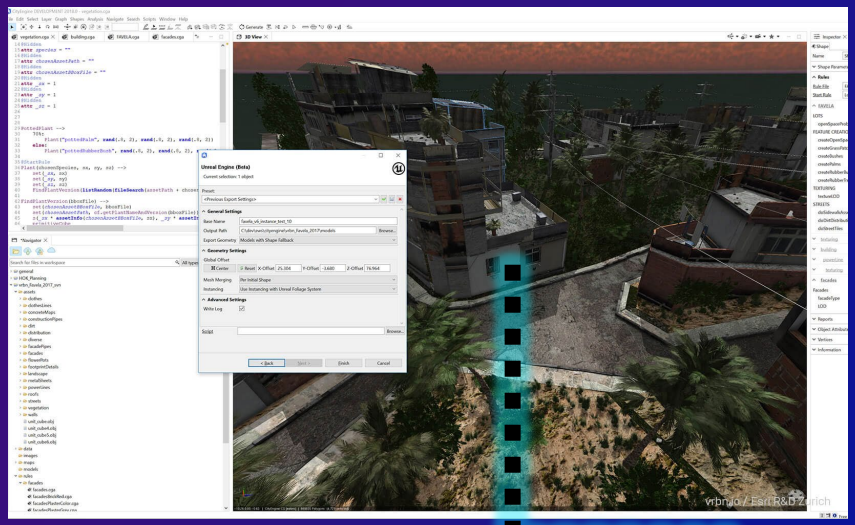
Visualization Capability Across the Platform

Reality

Game Engines



Esri in the Unreal Marketplace



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

unity

UNREAL ENGINE

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



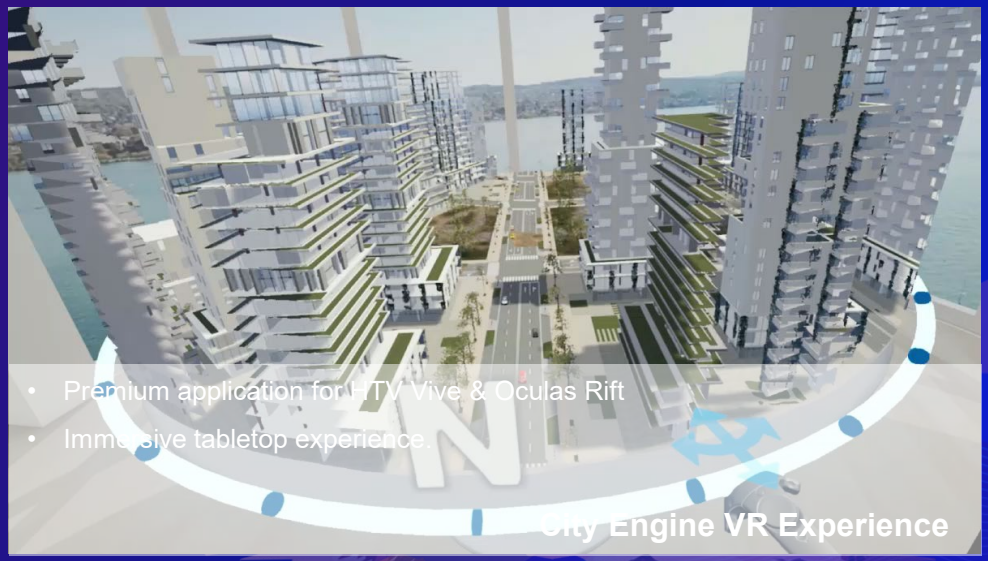
CityEngine 360 Visibility (3VR format)

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





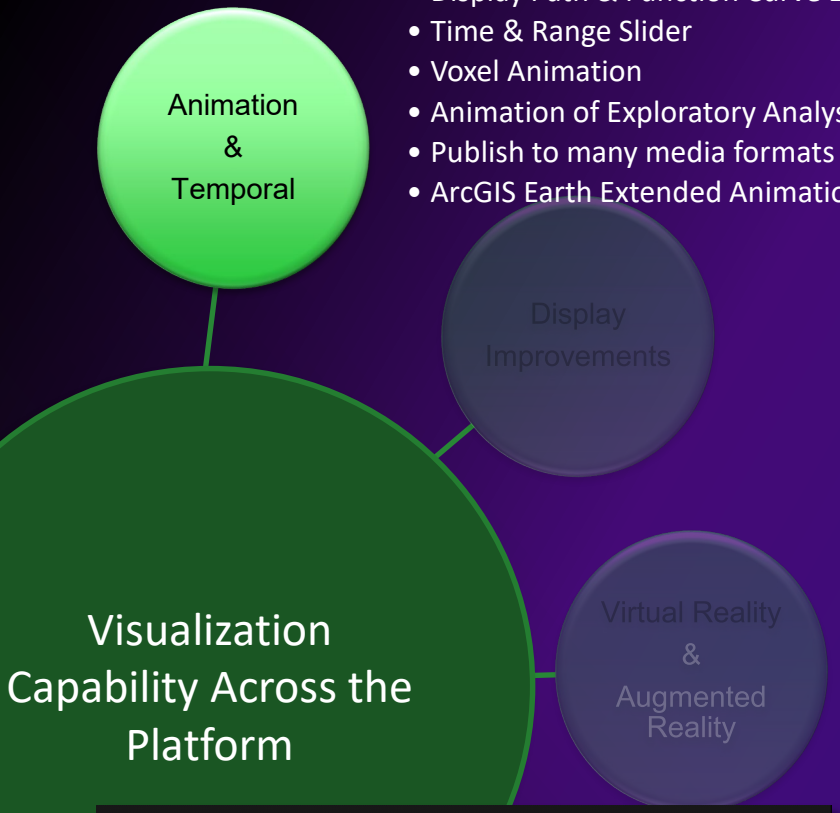
Try it out now with Gear VR: bit.ly/360_VR

Gear VR

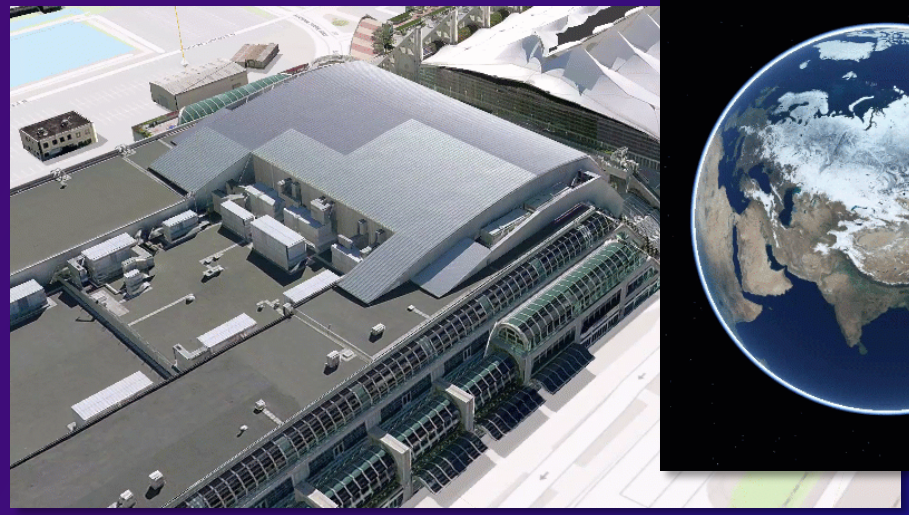
See the Webinar: bit.ly/CityEngine-Unreal

Animation & Temporal Visualization

Presenting data is enhanced through motion and time.



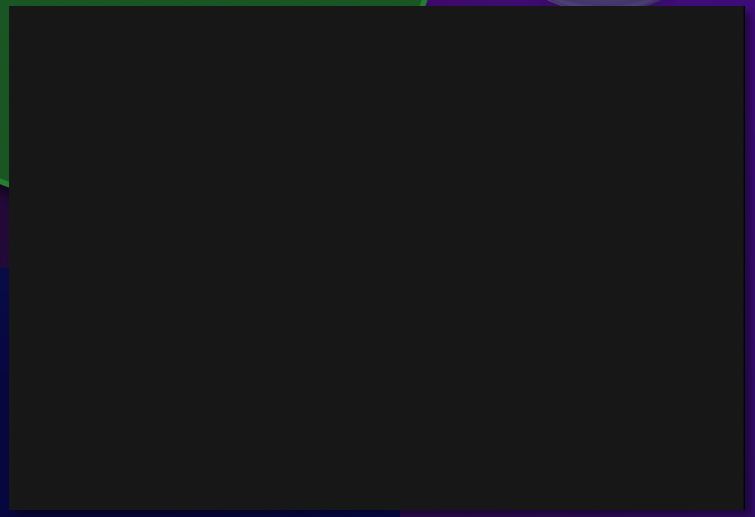
- Display Path & Function Curve Edits
- Time & Range Slider
- Voxel Animation
- Animation of Exploratory Analysis Tools
- Publish to many media formats
- ArcGIS Earth Extended Animation Toolset



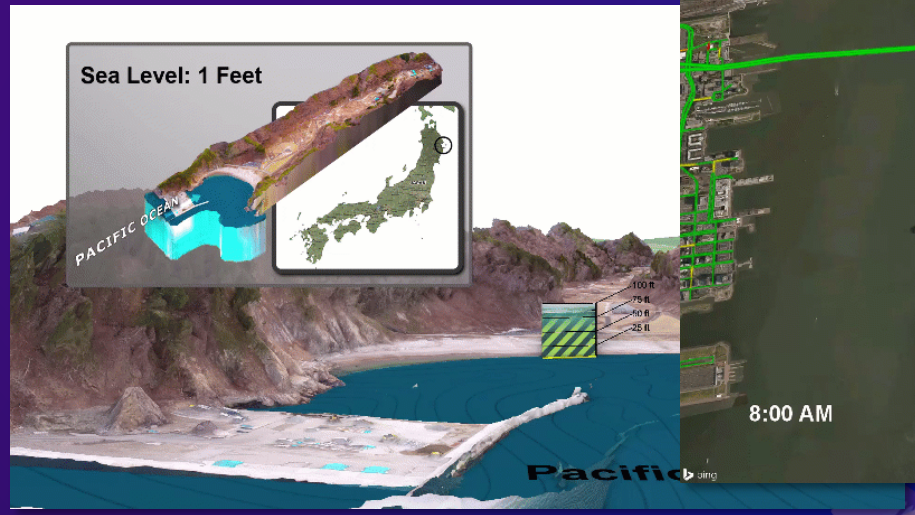
Present complex 3D with animation



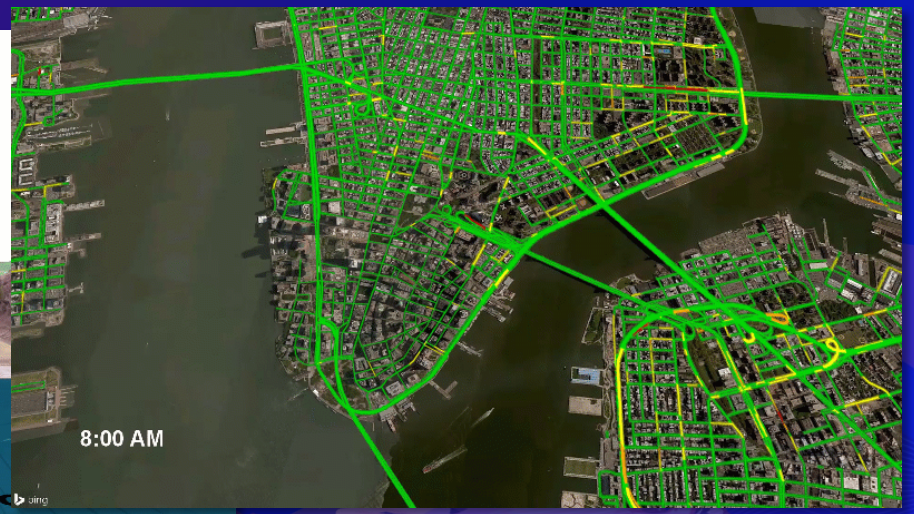
Communicate change and patterns



Animate Analysis to find answers



Present with images and text.



View & capture live temporal data.

3D Analysis Capabilities

For dedicated 3D Analysis Sessions:

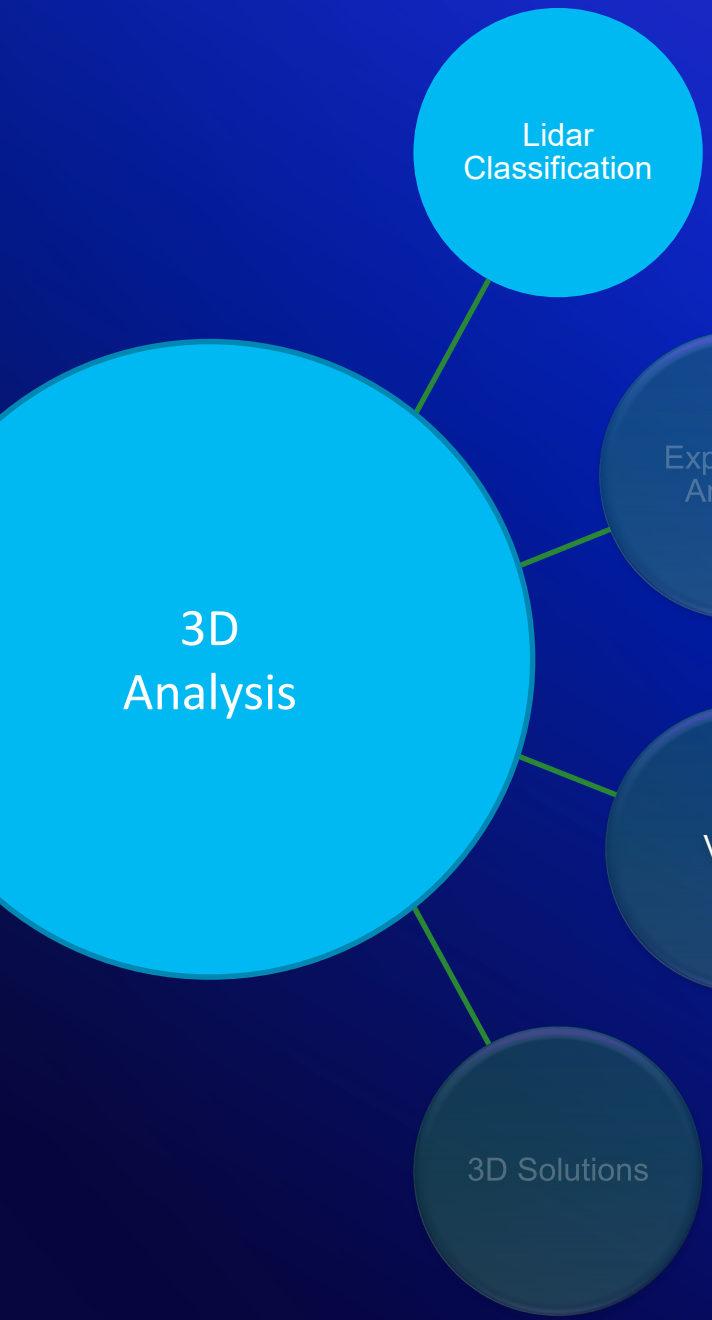
ArcGIS Pro: An Overview of 3D Analysis
Tues July 13 2:15 p.m. — 3:15 p.m. (PDT)

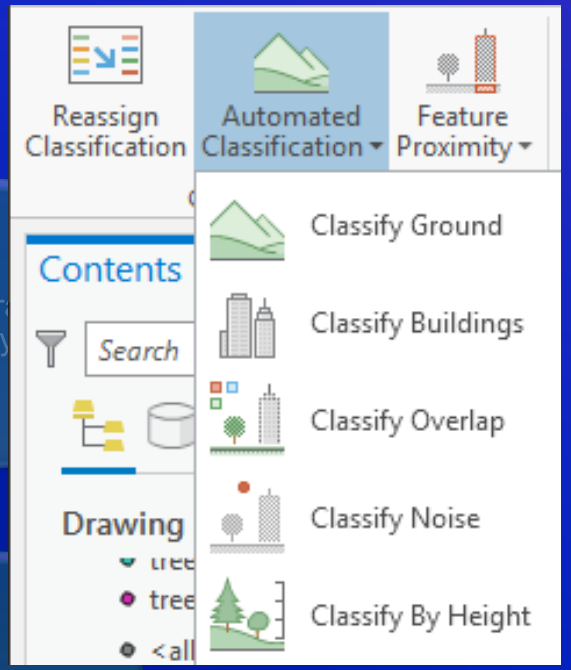
ArcGIS Pro: Taking Advantage of 3D
Wed July 14 10:00 a.m. — 11:00 a.m.

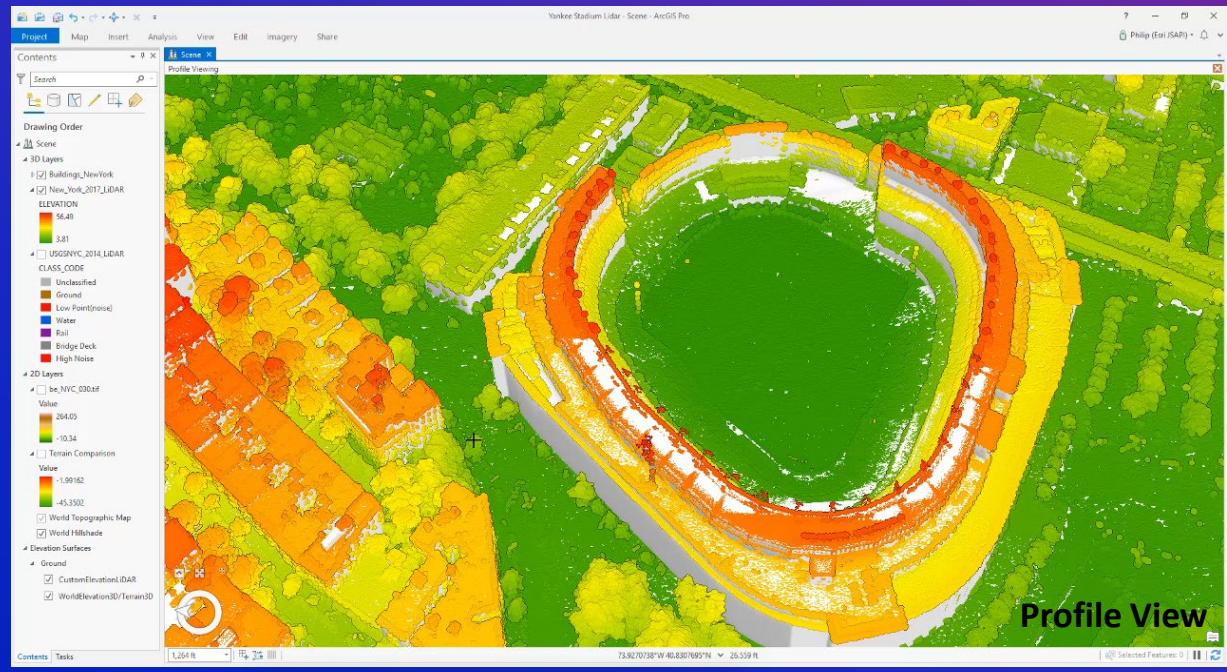
ArcGIS 3D Analyst: Lidar Classification and Feature Extraction
1:45 p.m. — 2:45 p.m.

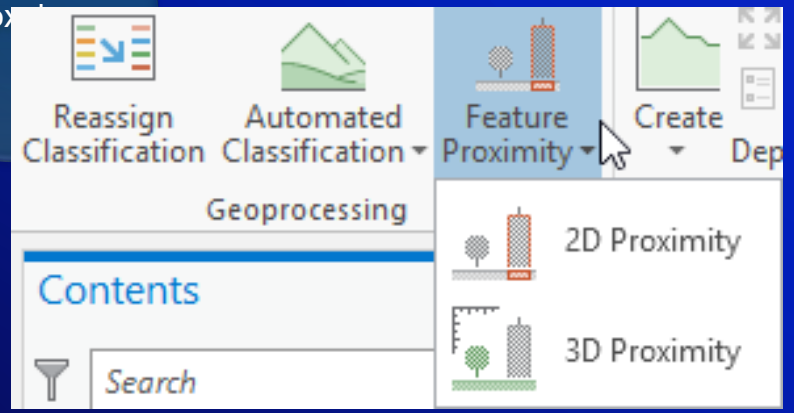
3D Analysis

Lidar Classification and supporting tools







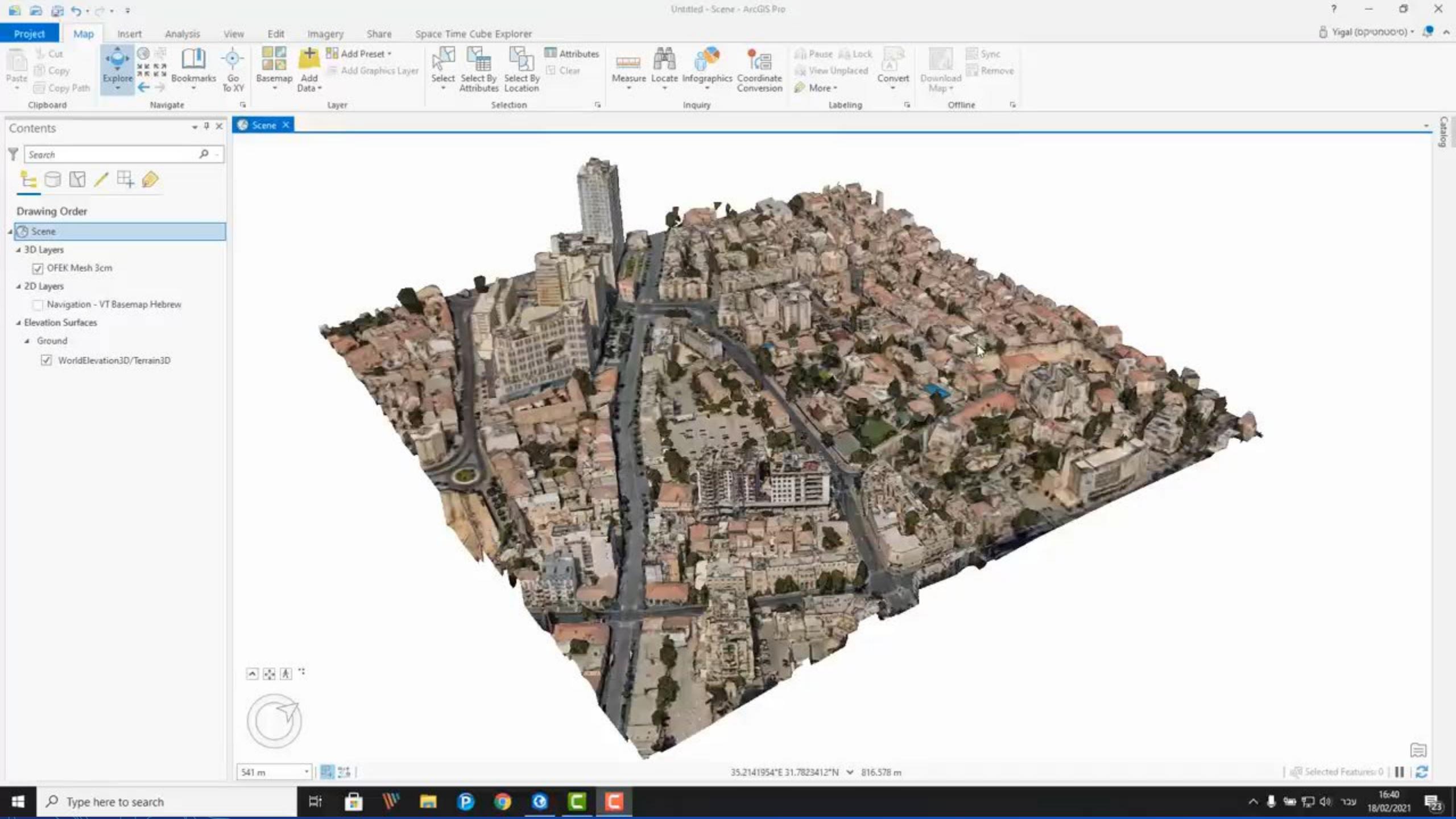




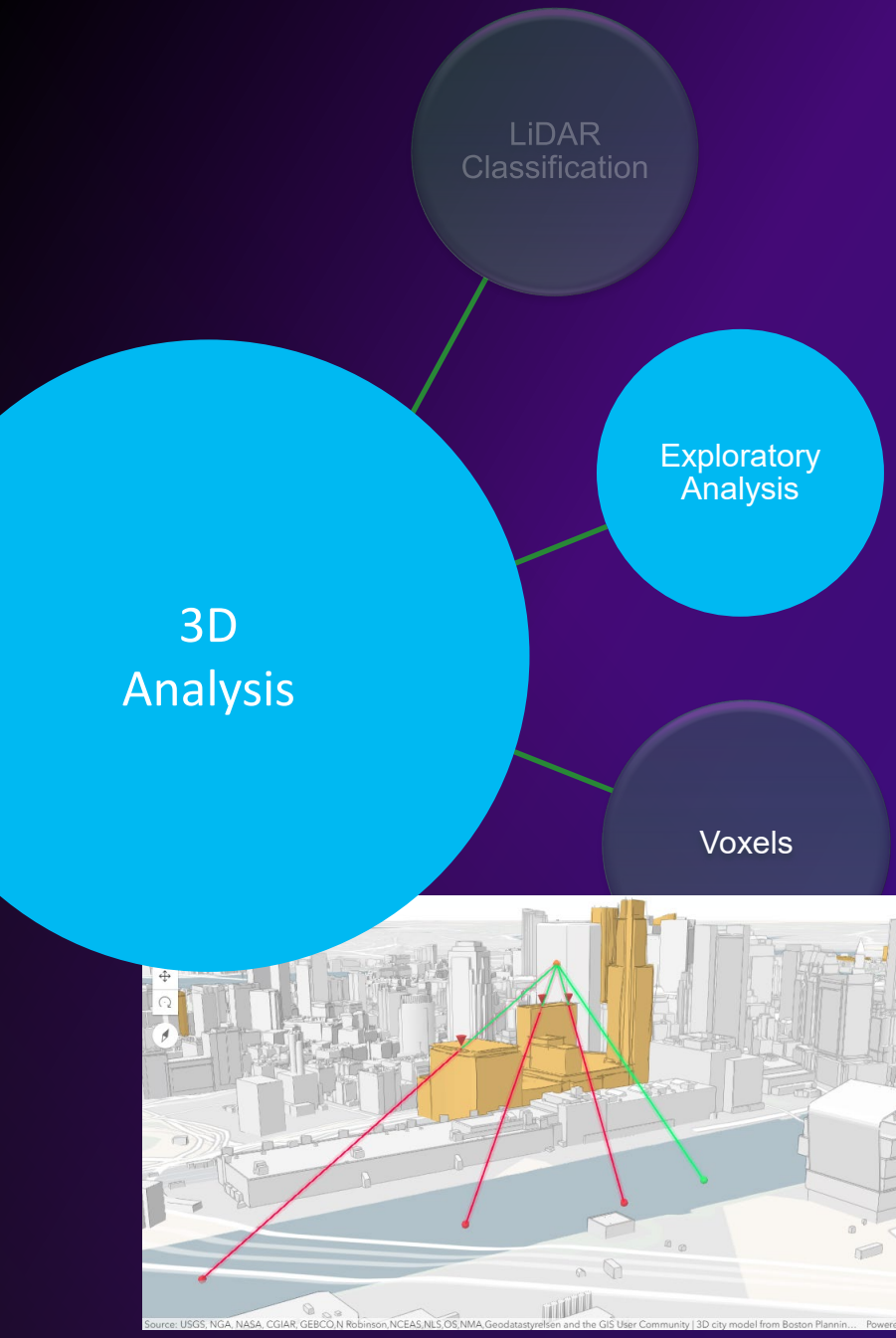
Colorize LAS



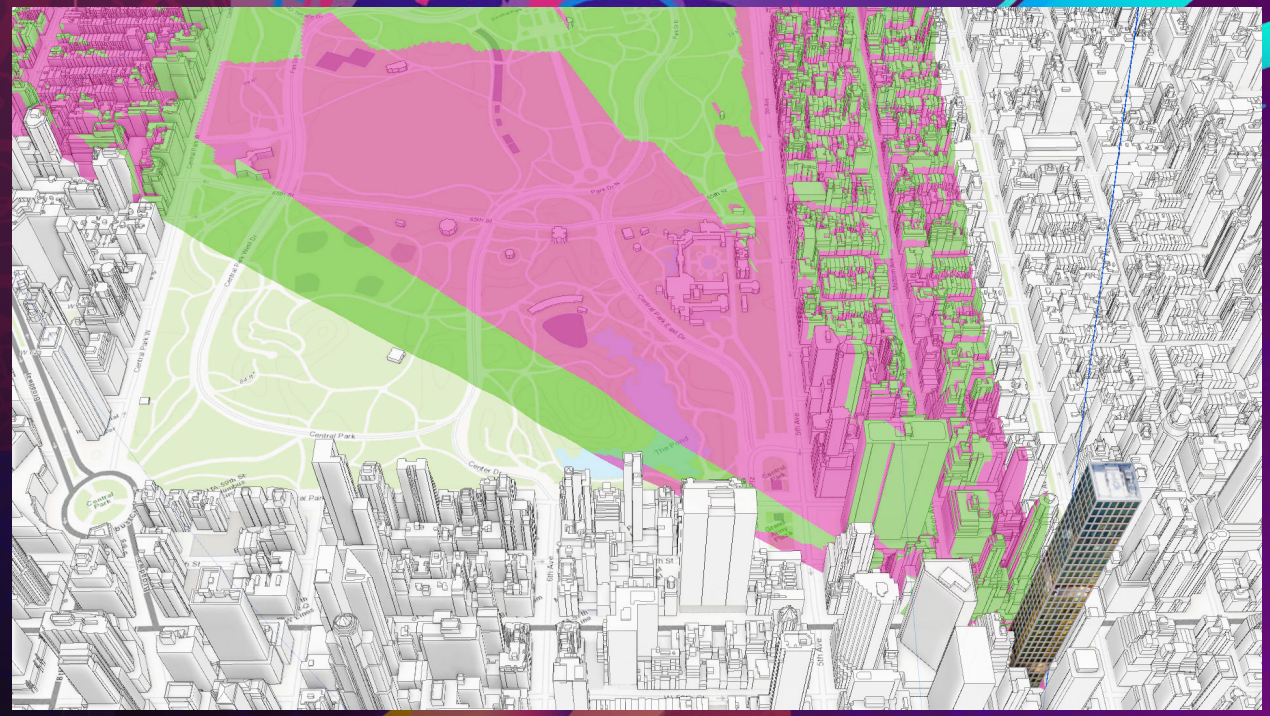



Untitled - Scene - ArcGIS Pro
Project
Map
Insert
Analysis
View
Edit
Imagery
Share
Space Time Cube Explorer
Cut
Copy
Copy Path
Paste
Explore
Bookmarks
Go To XY
Basemap
Add Data
Add Preset
Add Graphics Layer
Select
Select By Attributes
Select By Location
Attributes
Clear
Measure
Locate
Infographics
Coordinate Conversion
Pause
Lock
View Unplaced
More
Convert
Download Map
Sync
Remove
Clipboard
Navigate
Layer
Selection
Inquiry
Labeling
Offline
Contents
Search
Drawing Order
Scene
3D Layers
OFEK Mesh 3cm
2D Layers
Navigation - VT Basemap Hebrew
Elevation Surfaces
Ground
WorldElevation3D/Terrain3D
Scene
Catalog
541 m
35.2141954°E 31.7823412°N
816.578 m
Selected Features: 0
Type here to search
16:40
18/02/2021

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		
Elevation Profile	X	X	X
Object Detection	X		



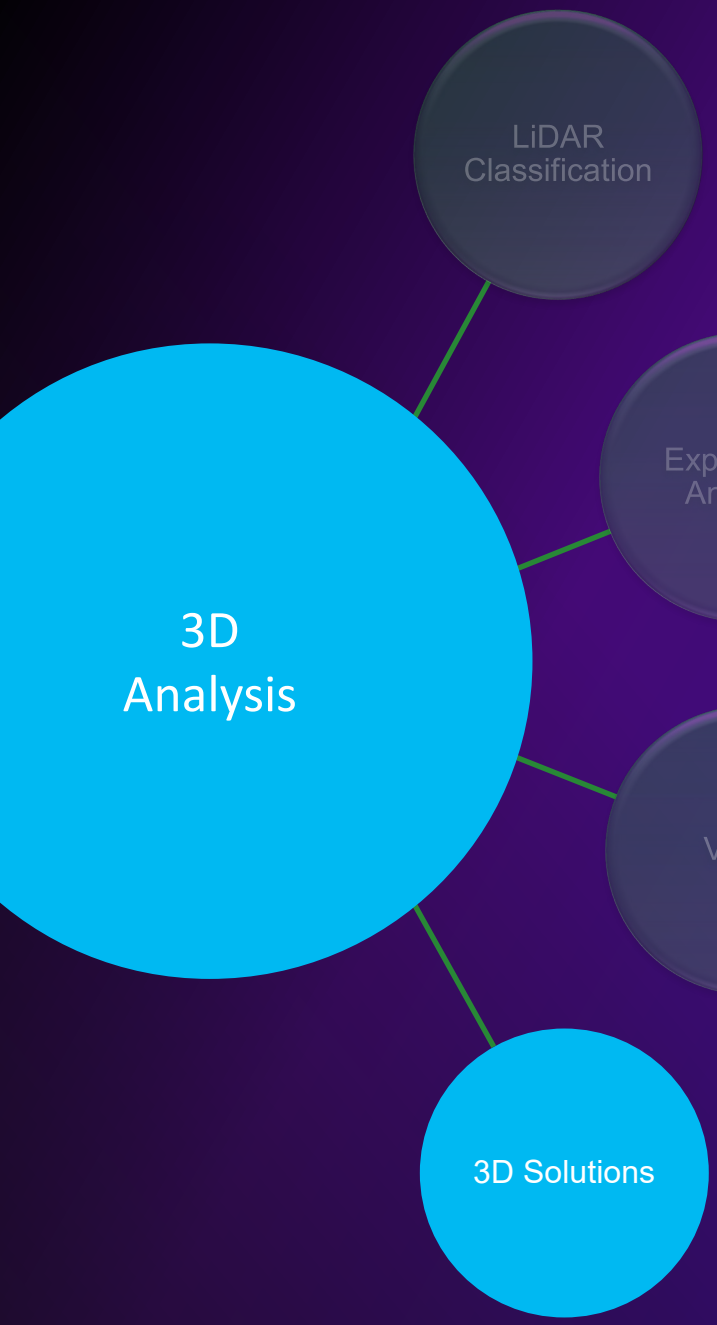
DEMO

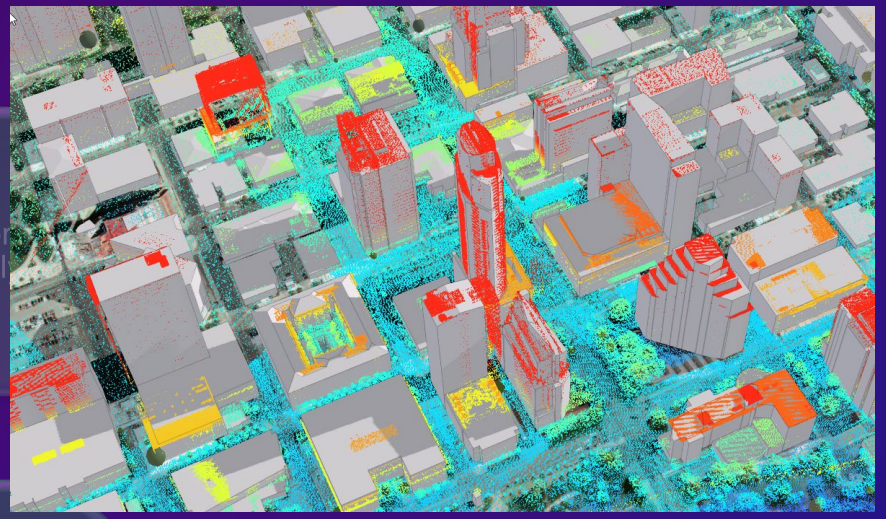
Stephen Heidelberg

3D Analysis

3D Solutions

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

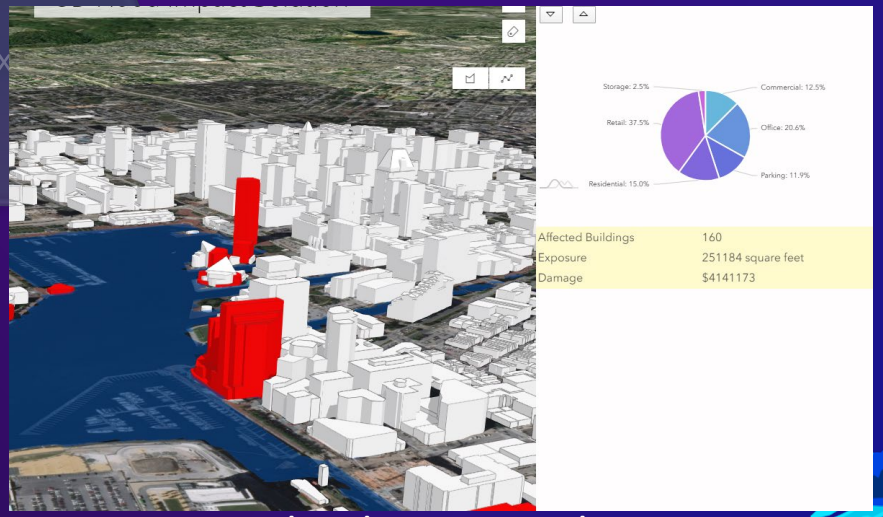




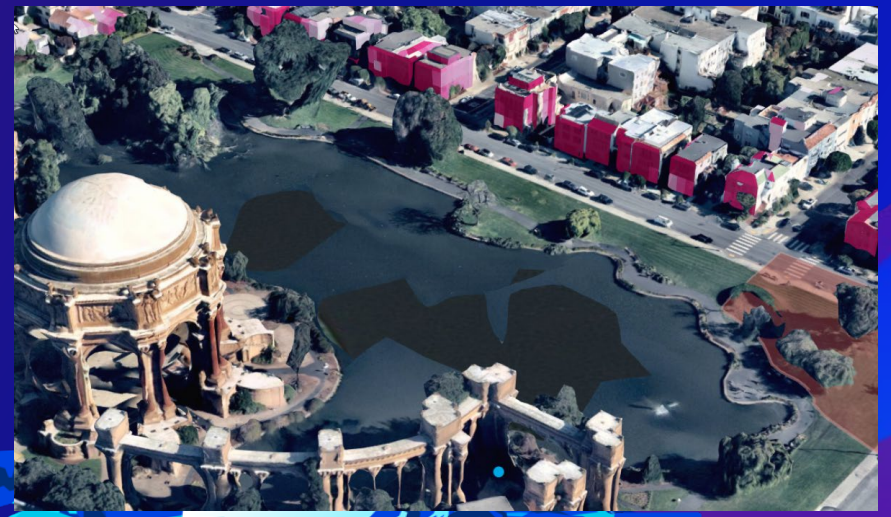
3D Basemap Solution



3D Tools for Power lines

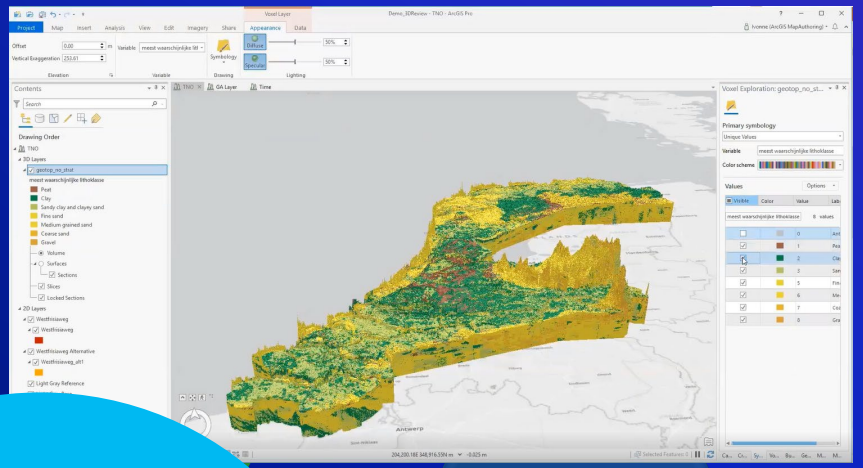


3D Flood Impact Solution

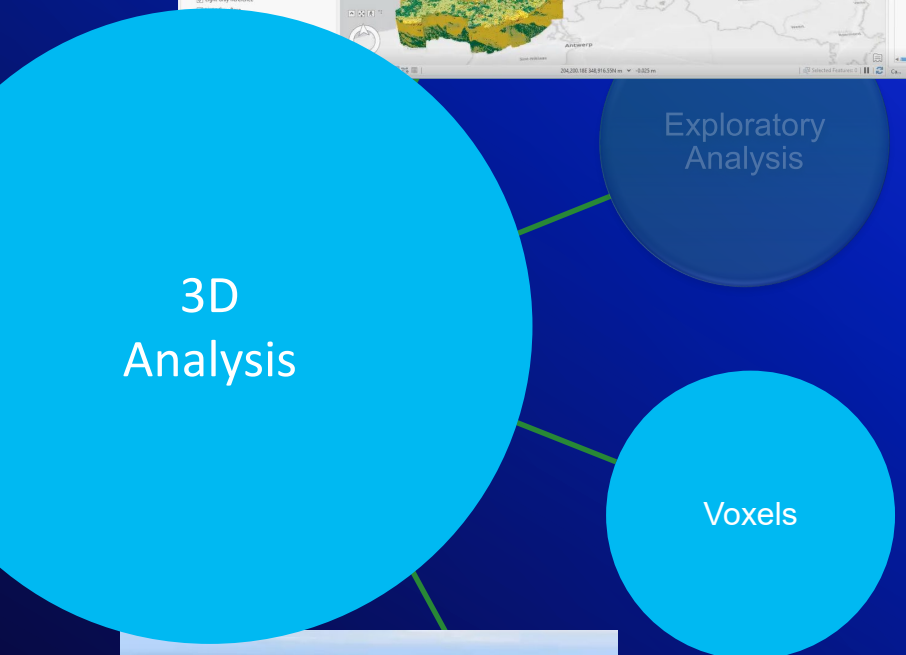


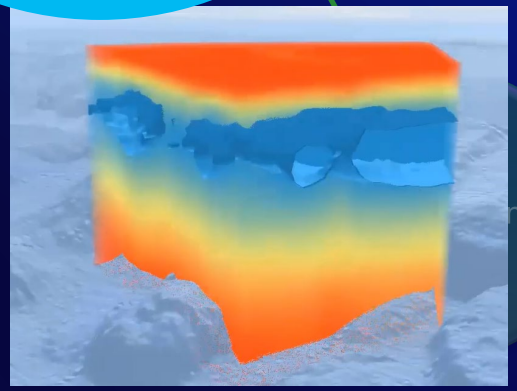
Visibility Assessment Solution

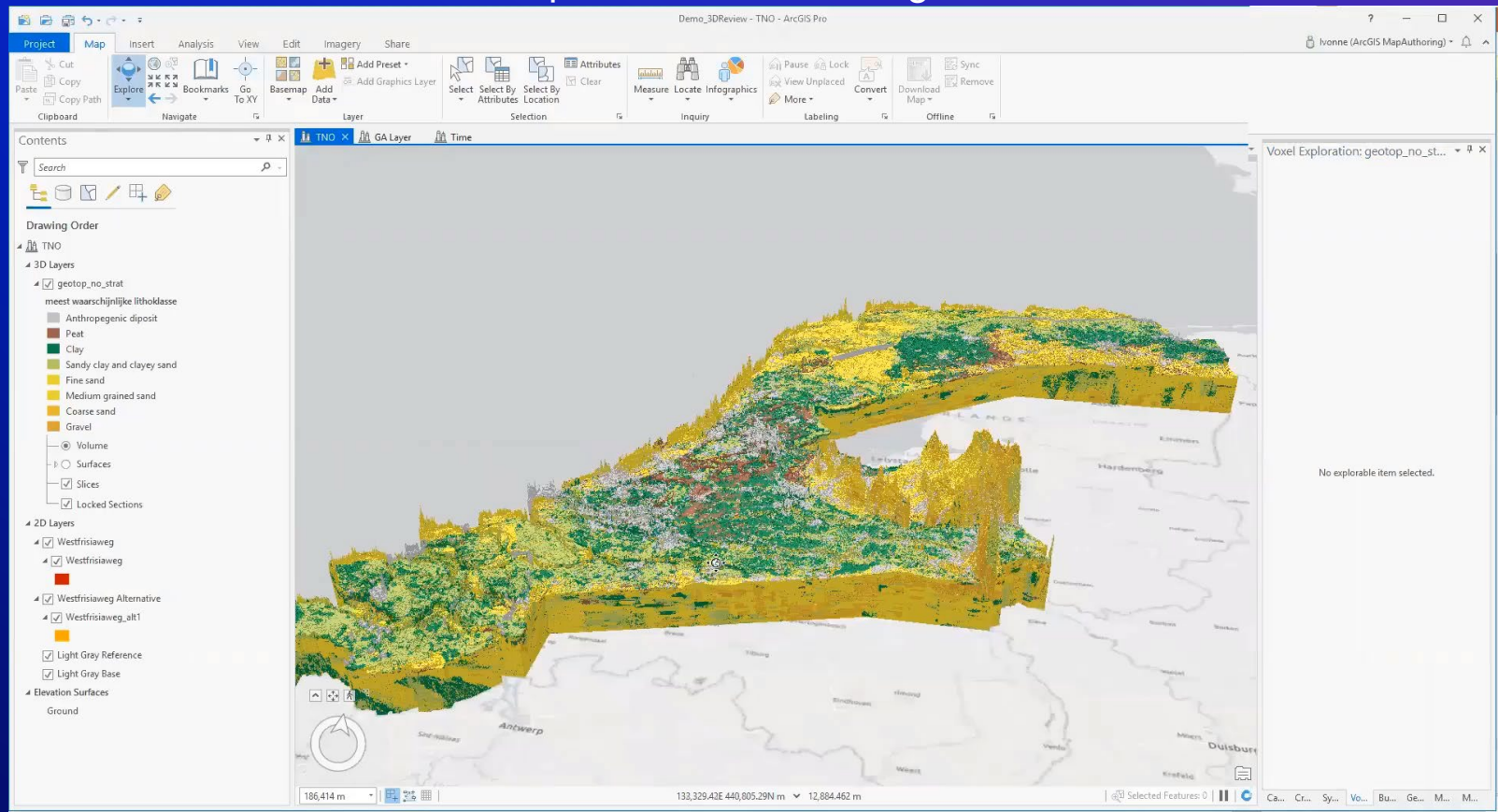
3D Analysis
Voxels

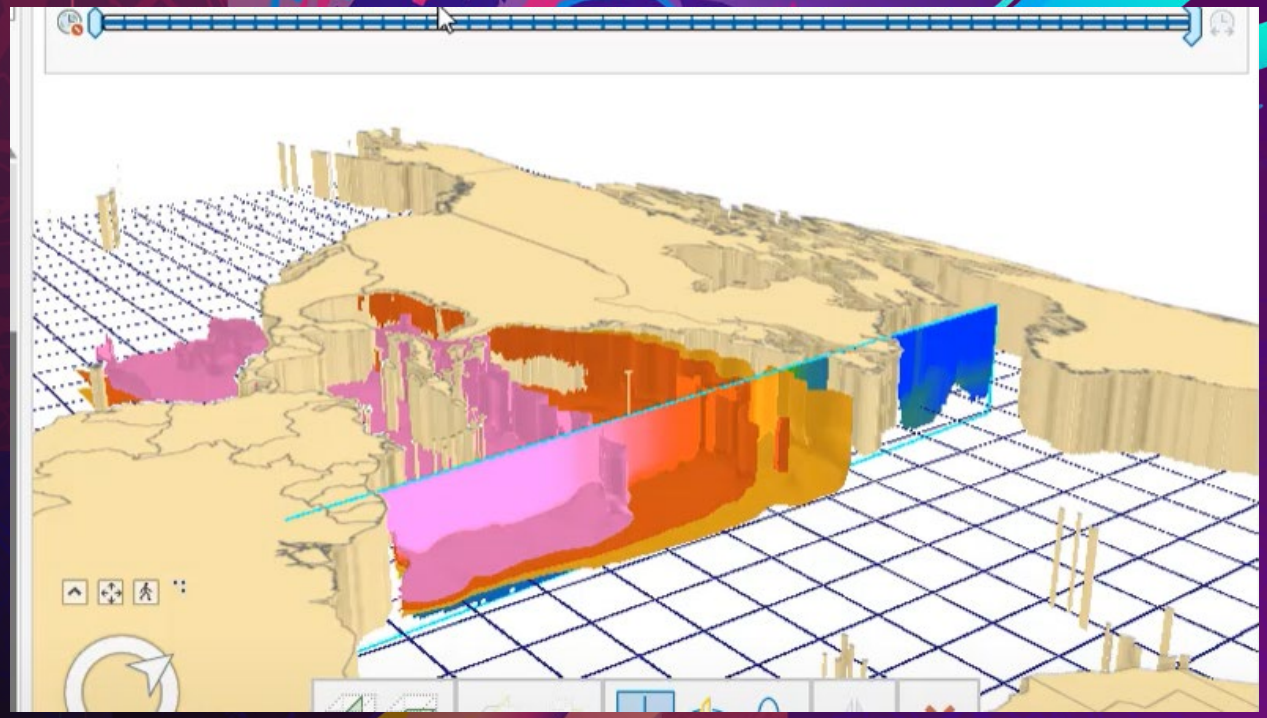


- Visualize large volumetric data
- Apply transparency gradients to focus on specific data
- Create multiple slices with moving, rotatable planes
- Create isosurfaces of the data
- Consume 3D EBK, Space time cube and gridded netCDF data









Voxel Overview

Ivonne Seler

ArcGIS

3D Content Creation, Editing and Data Management

See Also:
Sharing 3D Content with Scene Layers (I3S)
Wed July 14, 2021 1:45 p.m. — 2:45 p.m. PDT

Content Creation, Editing and Data Management

Distributed Collaboration

Distributed Collaboration

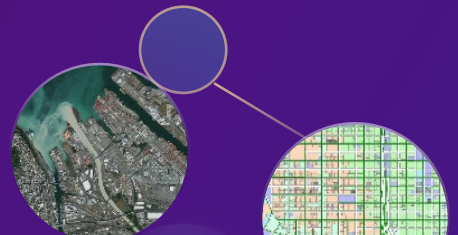
Content Creation, Editing and Data Management

Scene Layers

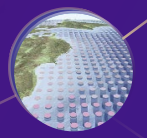
Feature Layers

Editing Improvements

Large Uploads and Enterprise Considerations









Construction Group

Copy of data

Public Safety

Copy of data

Land Records

Architect

Copy of data

Municipal Engineering

Copy of data

- Establishes a **trusted connection** with other ArcGIS Enterprise environments and ArcGIS Online
- Allows you to quickly and easily **share data and** [illegible] across systems
- Helps provide a [illegible] 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

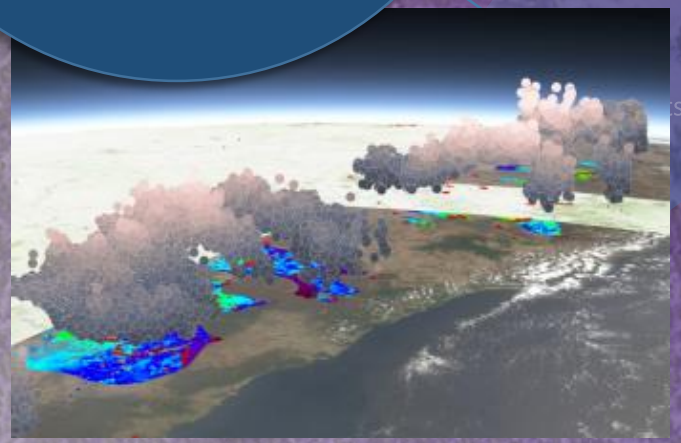
Scene Layers

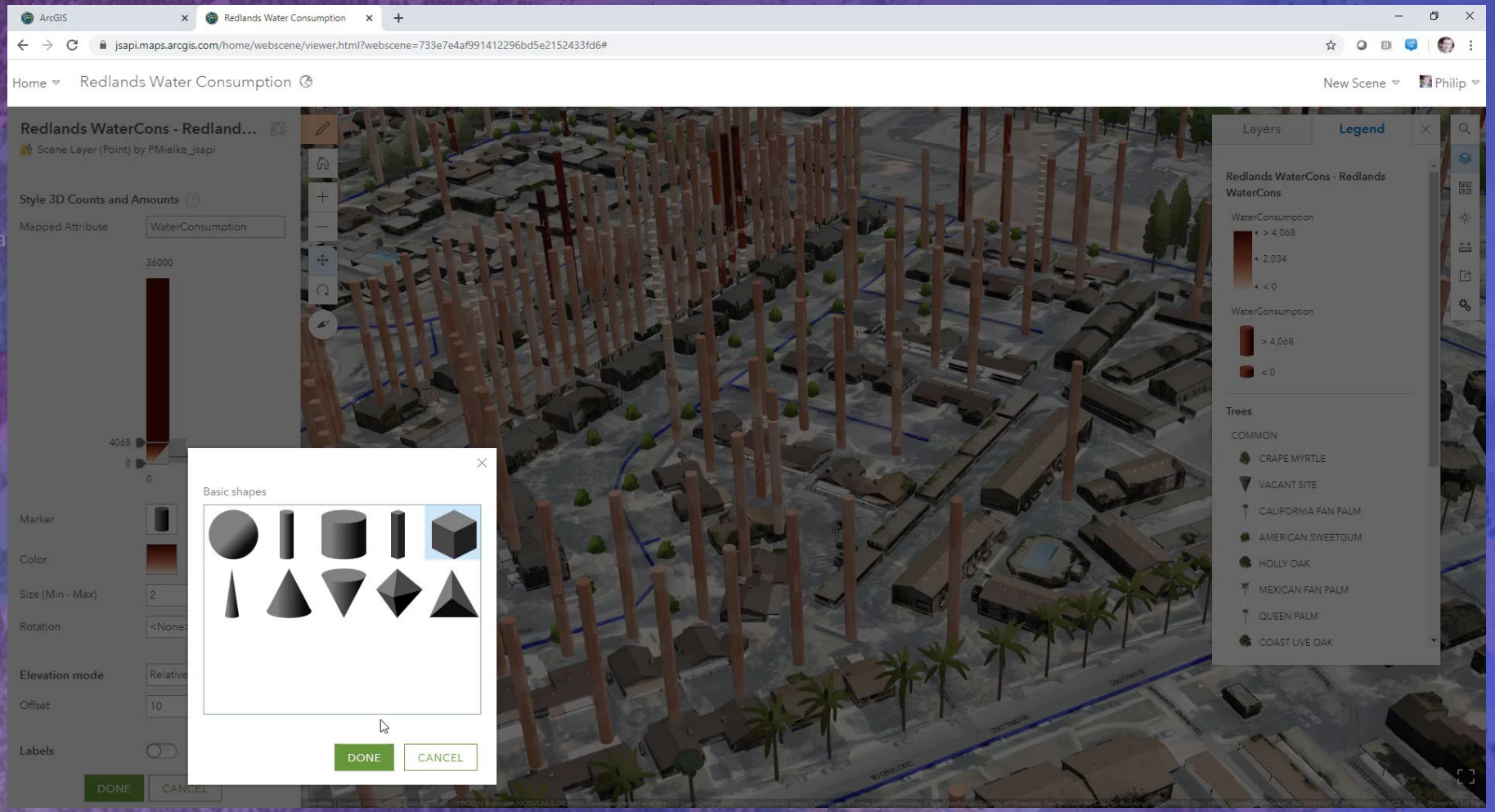
Content Creation, Editing and Data Management

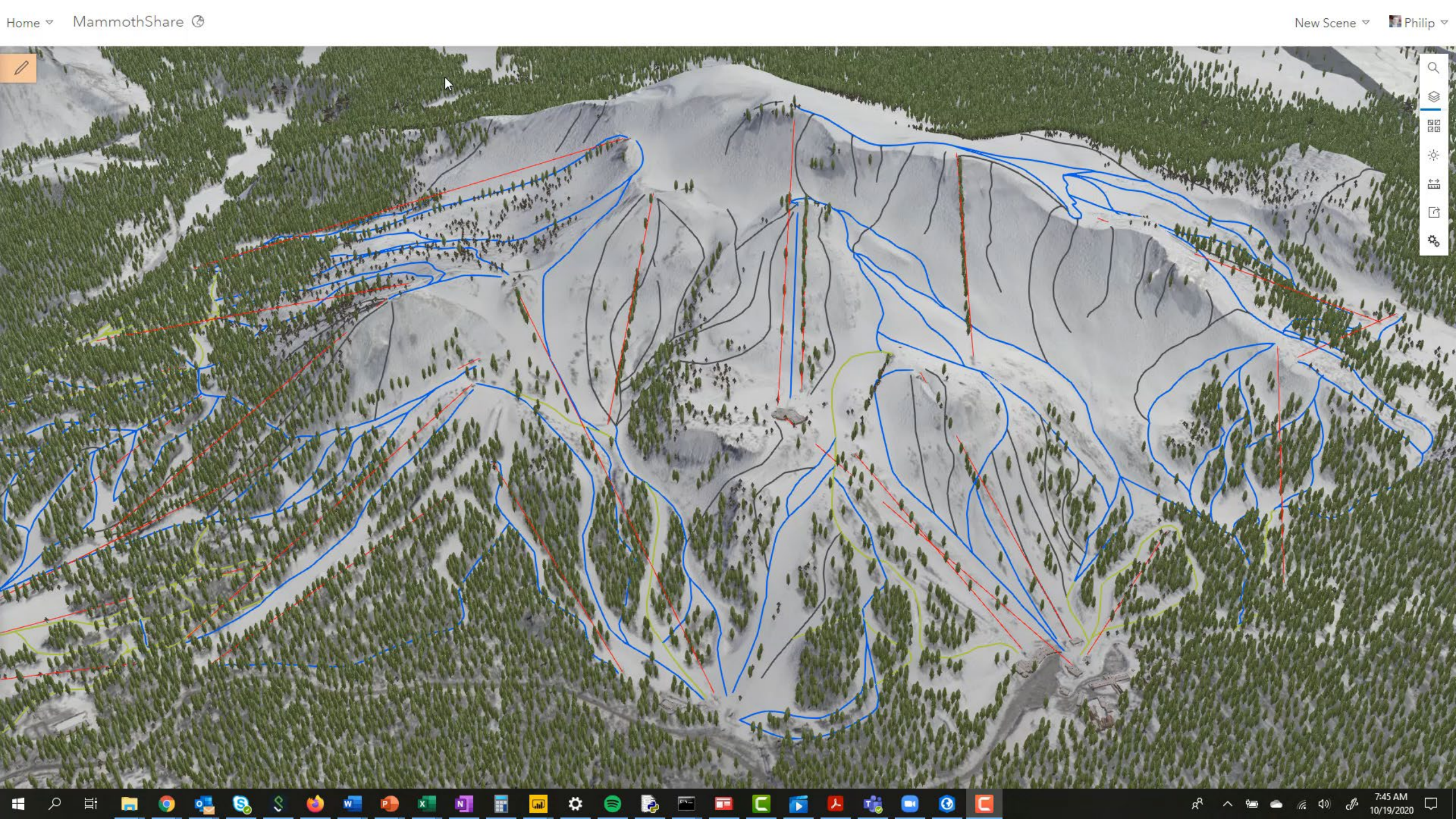
Feature La

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

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

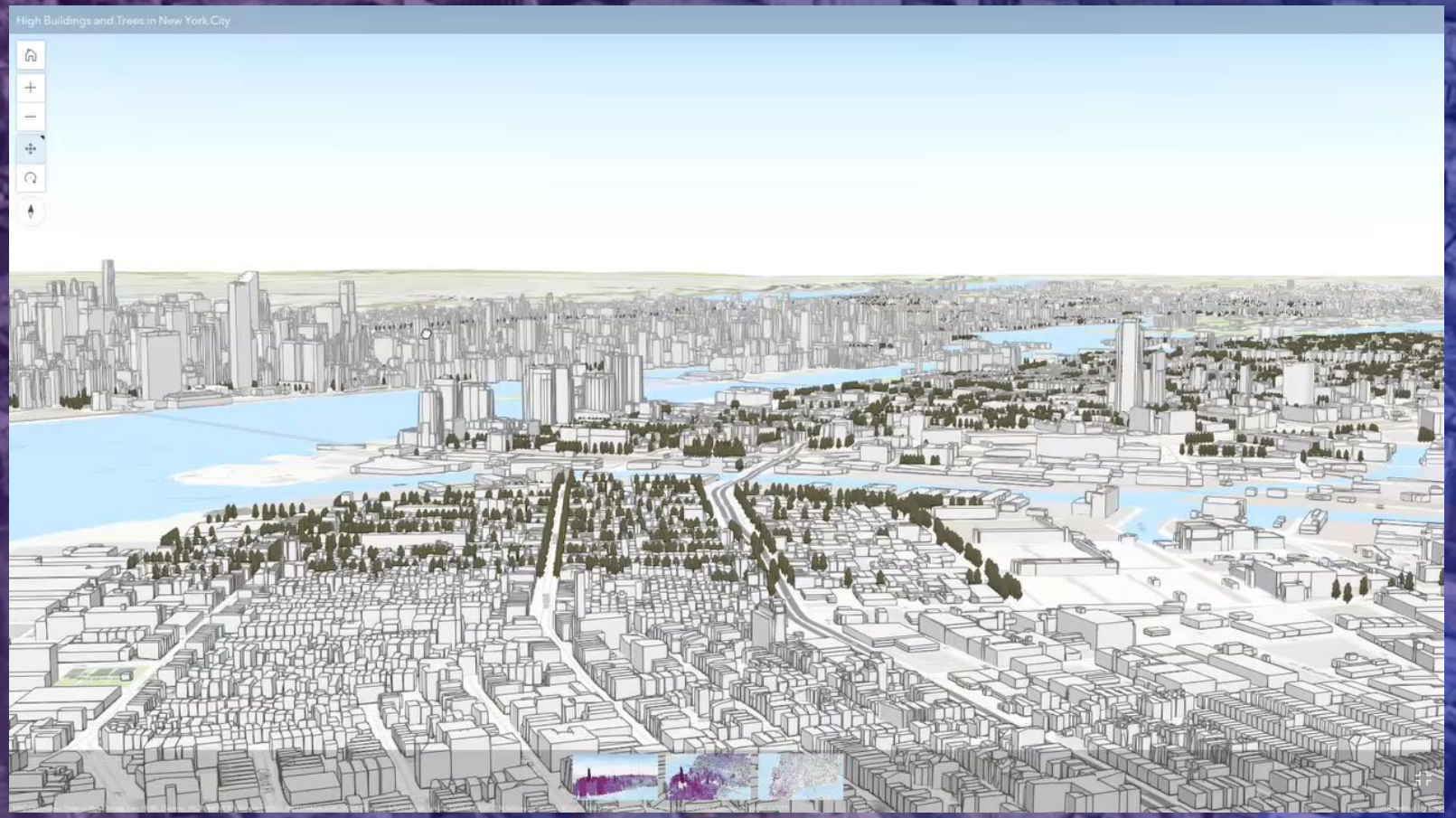
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

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

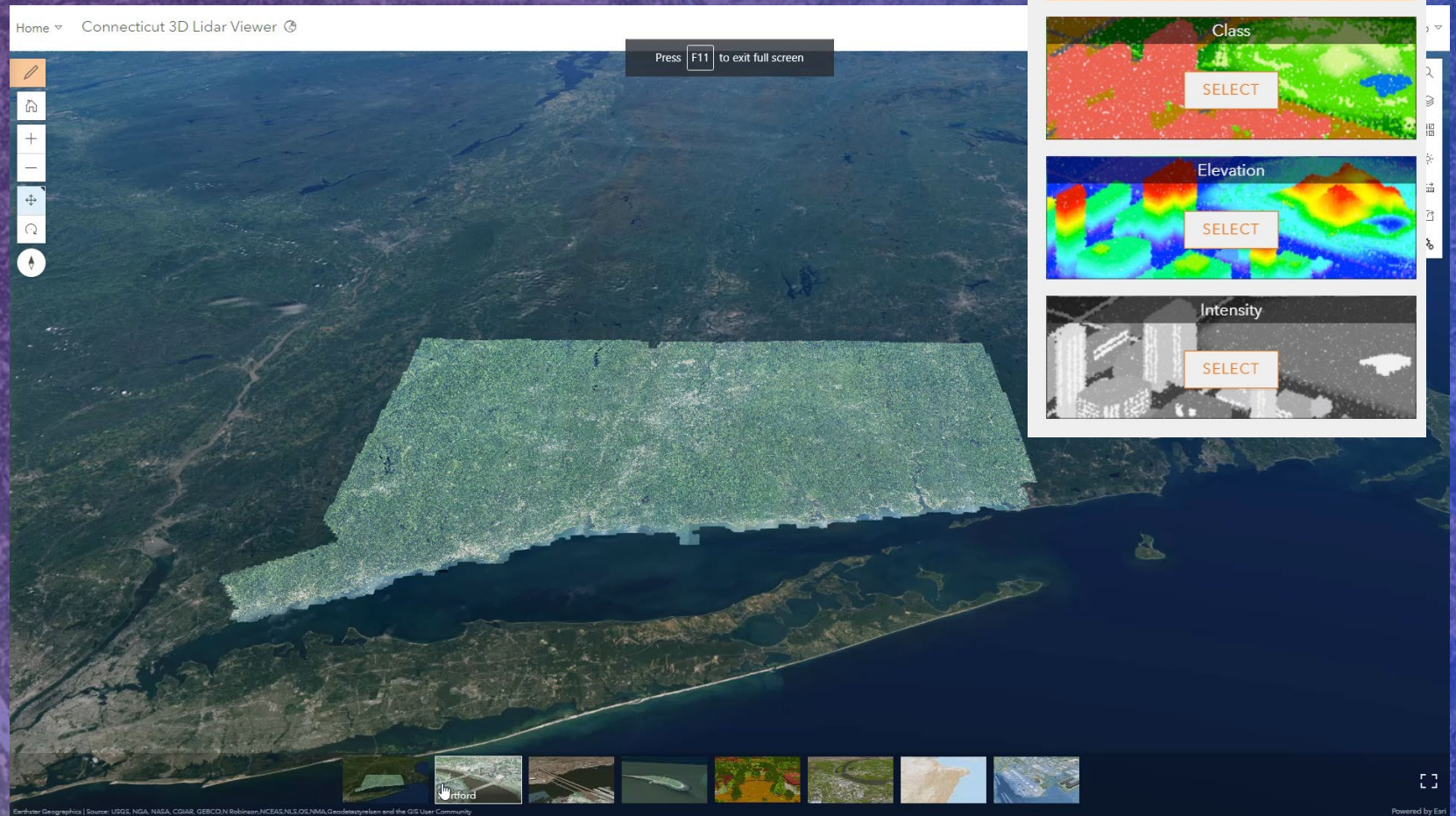
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

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

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Editing Improvements

Large Uploads and Enterprise Considerations



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

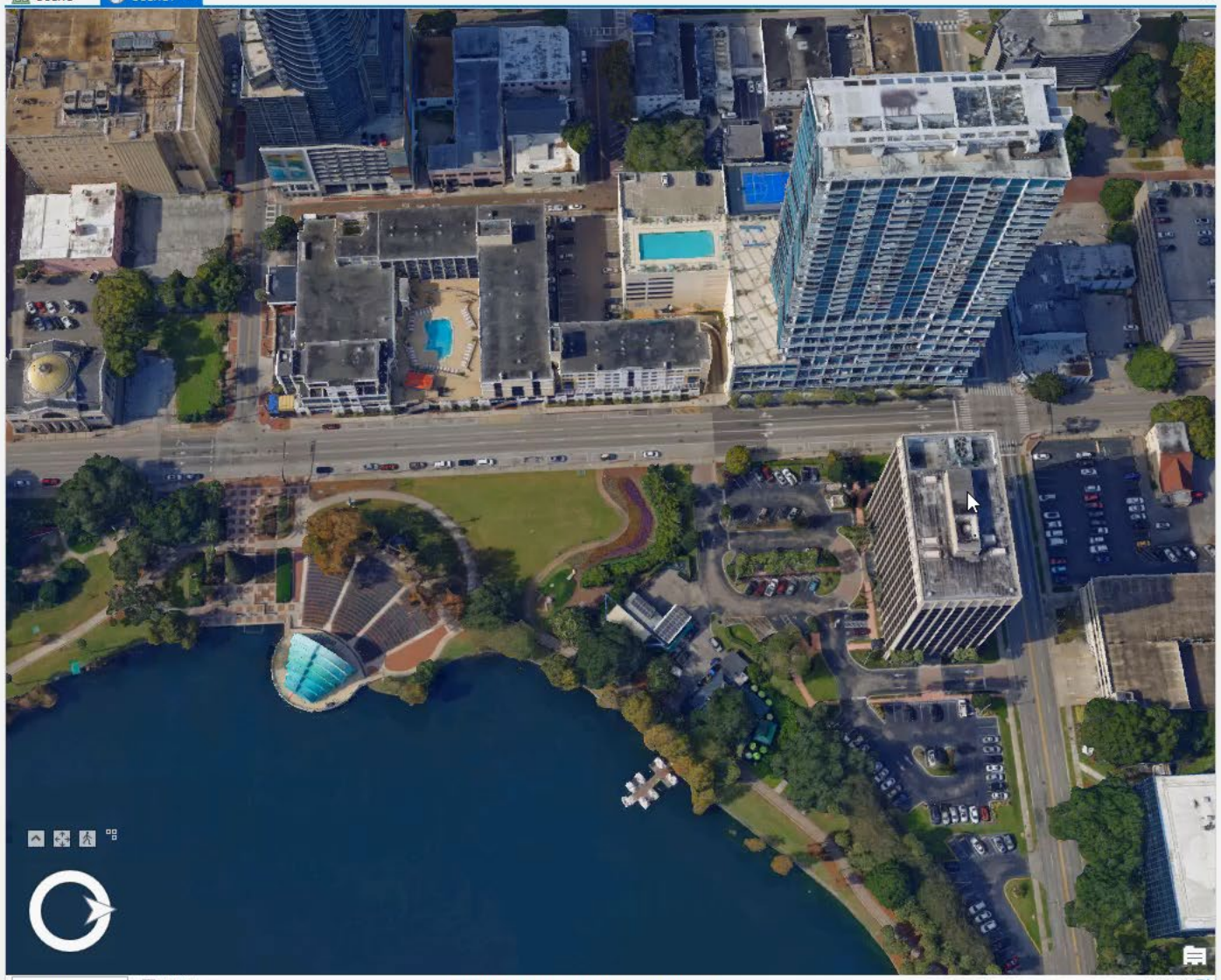
Search

Drawing Order

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

Contents | Tasks

Scene | Scene1



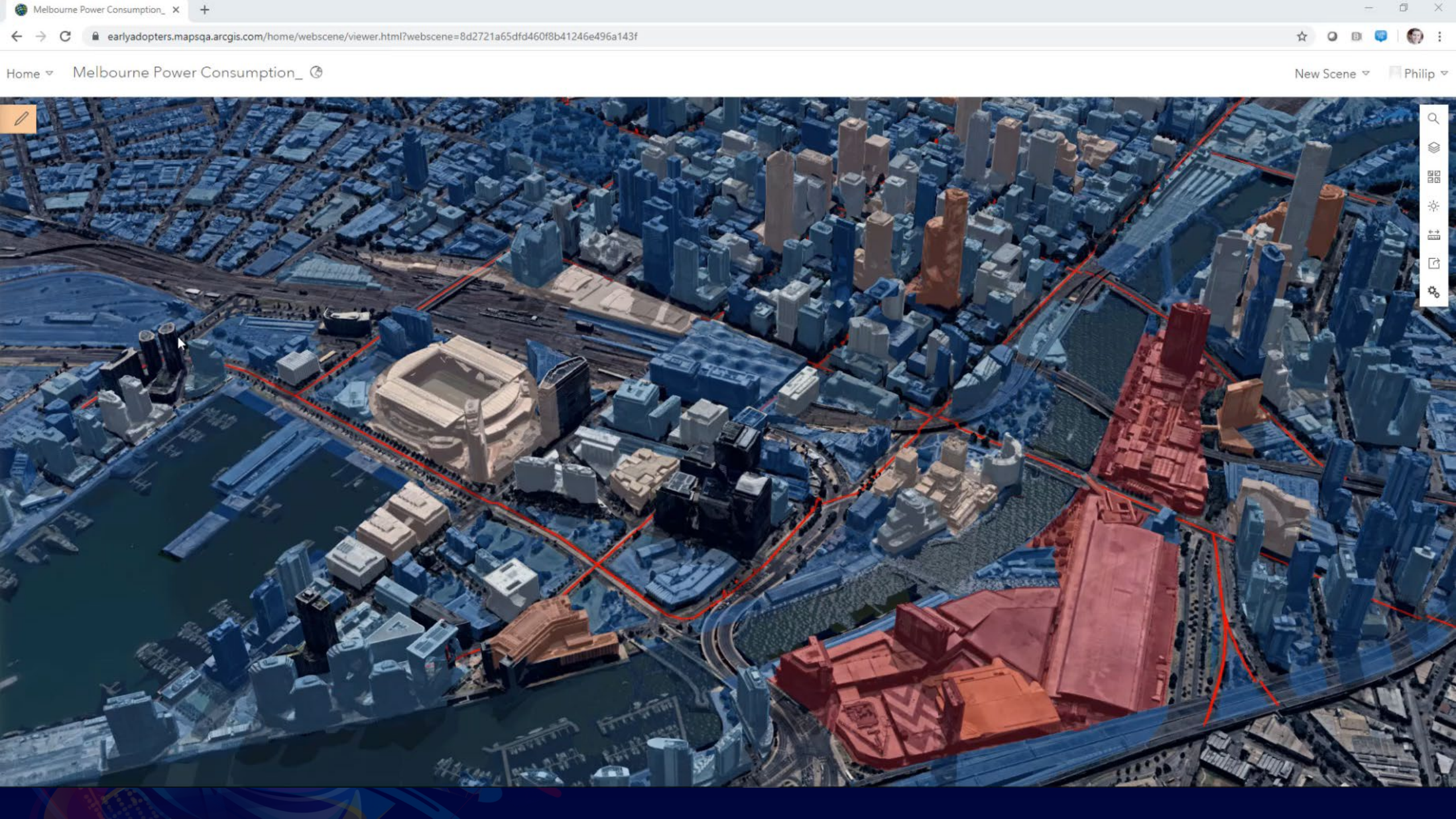
1,378 ft | 81.3764724°W 28.5437600°N | 129.072 ft | Selected Features: 0

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

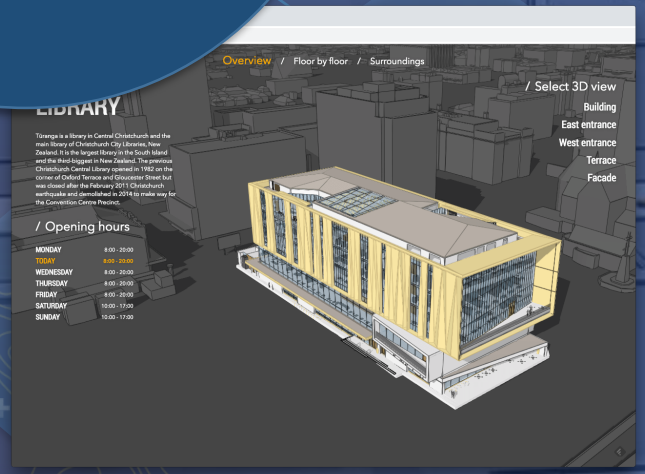
Distributed Collaboration

Scene Layers

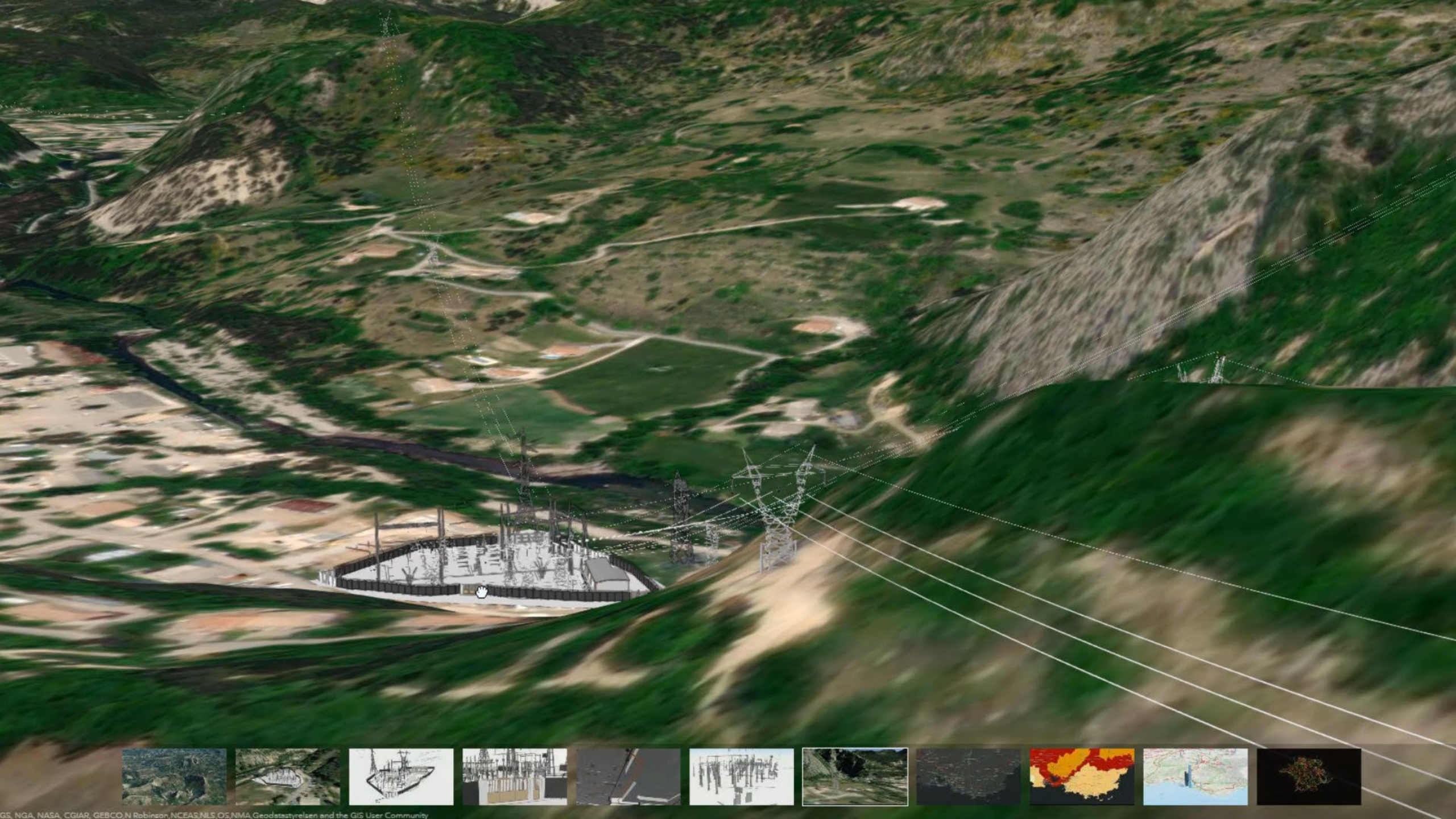
- Point Scene Layer
- 3D Object Scene Layer
- Point Cloud Scene Layer
- Integrated Mesh Scene Layer
- Building Scene Layer

Content Creation, Editing and Data Management

Feature Layers





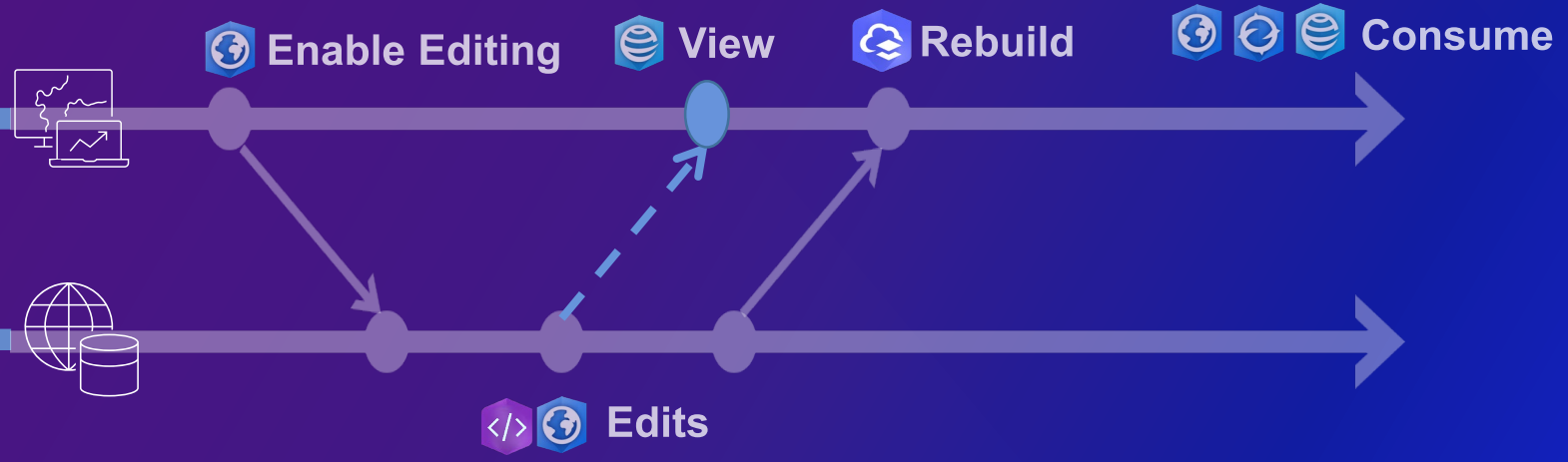


GS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NIMA,Geodatastyrelsen and the GIS User Community

Content Creation, Editing and Data Management

Maintain: Scene Layer with Associated Feature Layer

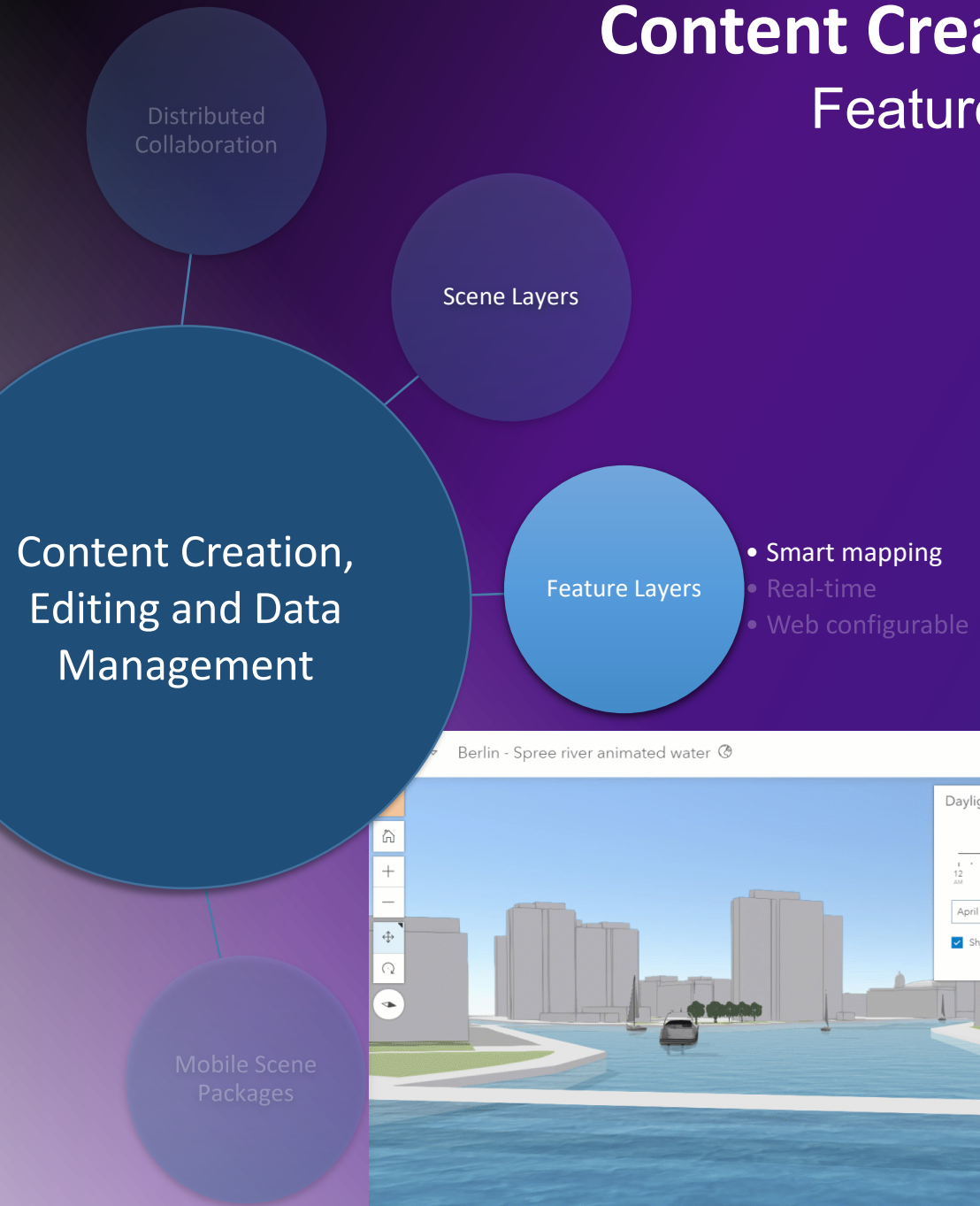




- **Point, 3D Object and Building scene layer with associated feature layer**
- **Author editable scene layer**
  - **By ref (Enterprise)**
  - **By value**
- **Rebuild Scene Layer Online with Partial Updates (avoiding rebuilding entire Cache)**
- **NEW! Scene layer refers to associated feature layer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

Content Creation, Editing and Data Management

Feature Layers: Smart mapping & styling on the web

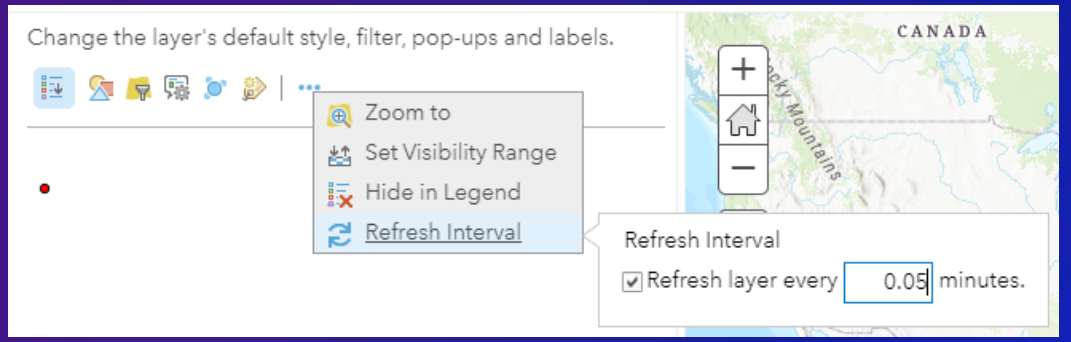






Content Creation, Editing and Data Management

Feature Layers: Real-time





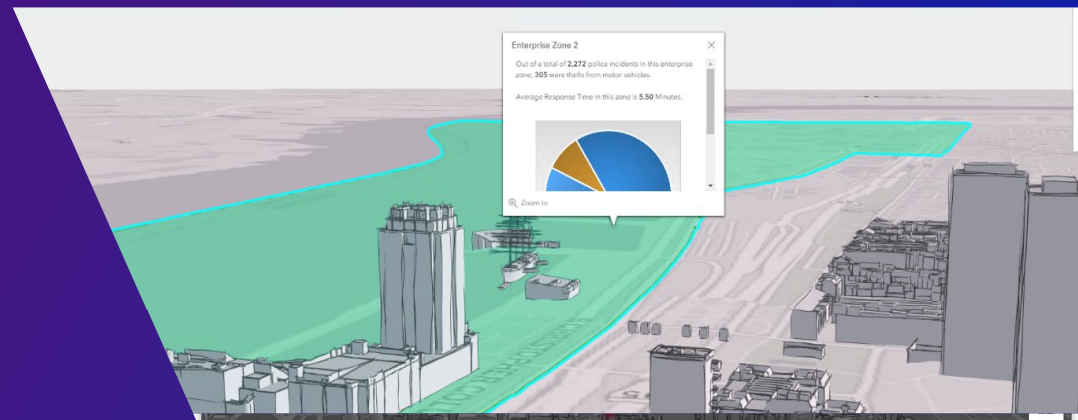


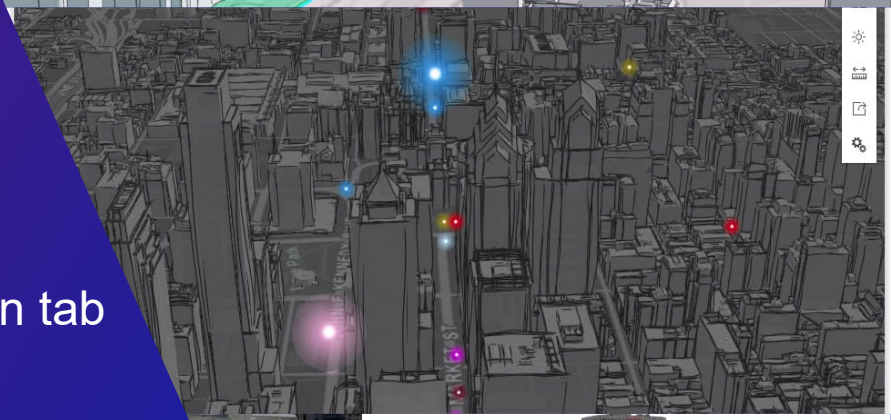
Content Creation, Editing and Data Management

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 in Scene Viewer

Distributed Collaboration

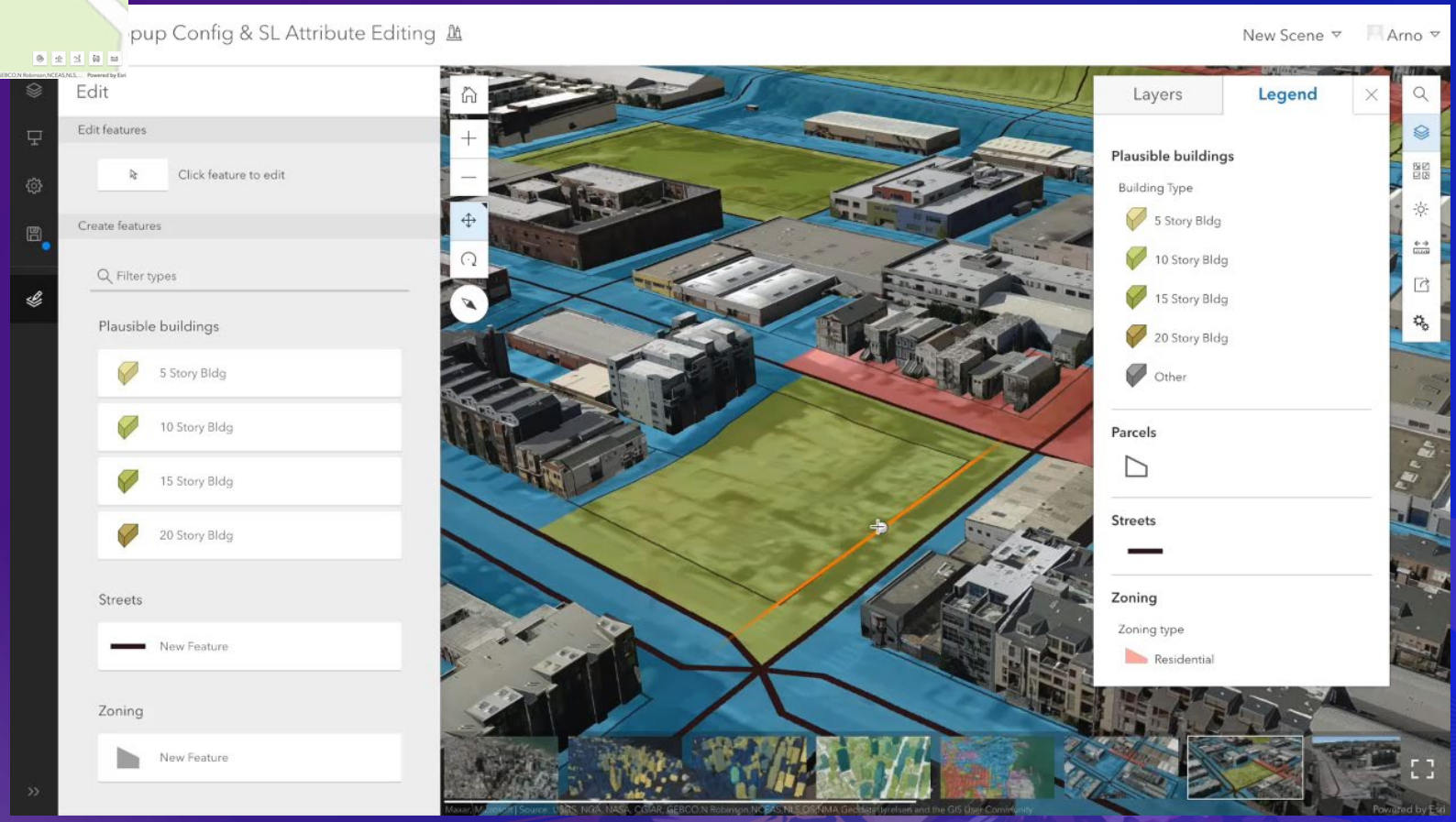
Content Creation, Editing and Data Management

Feature Layers

Editing Improvements

Scene Layer Data Management





Content Creation, Editing and Data Management

Scene Layer Data Management Improvements



- Integrated Mesh to Multipatch
  - Extracts textured multipatch from photogrammetrically-generated integrated mesh for individual feature management and more analysis options
- I3S Update GP Tool
  - Upgrade scene layers to take advantage of performance improvements in 3D web experiences
- Clip Scene Layer Package
  - Requested feature to clip and easily distribute data
- Project Scene Layer Package
  - Better support for projection requirements



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: Object Detection

3D Data Management

Scene Layers can now be clipped to an extent, and projected to new coordinate systems

Realistic Visualizations

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

3D Object Feature Layer

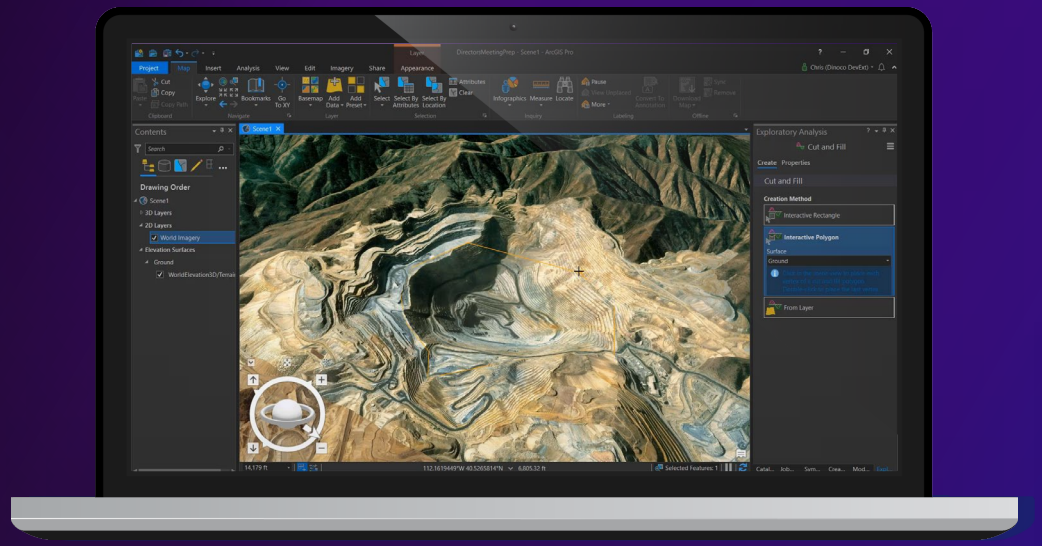
New layer type that captures modern 3D model properties and is intended to become the successor to multipatch

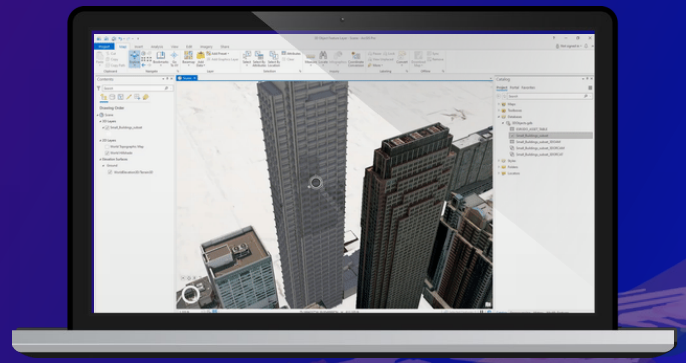
Animation for static and dynamic story telling

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

Web-based virtual reality solution

The new ArcGIS 360 VR is now available as a web app, based on the latest WebXR technology. With just a few clicks in CityEngine, you can create 360 VR experiences (3VR) and conveniently preview them in a browser.

Terrain sculpting & masking

The Terrain Edit Brush allows localized levelling of terrains, and the Terrain Reset Brush lets you revert the terrain elevation changes.

Better design and editing experience

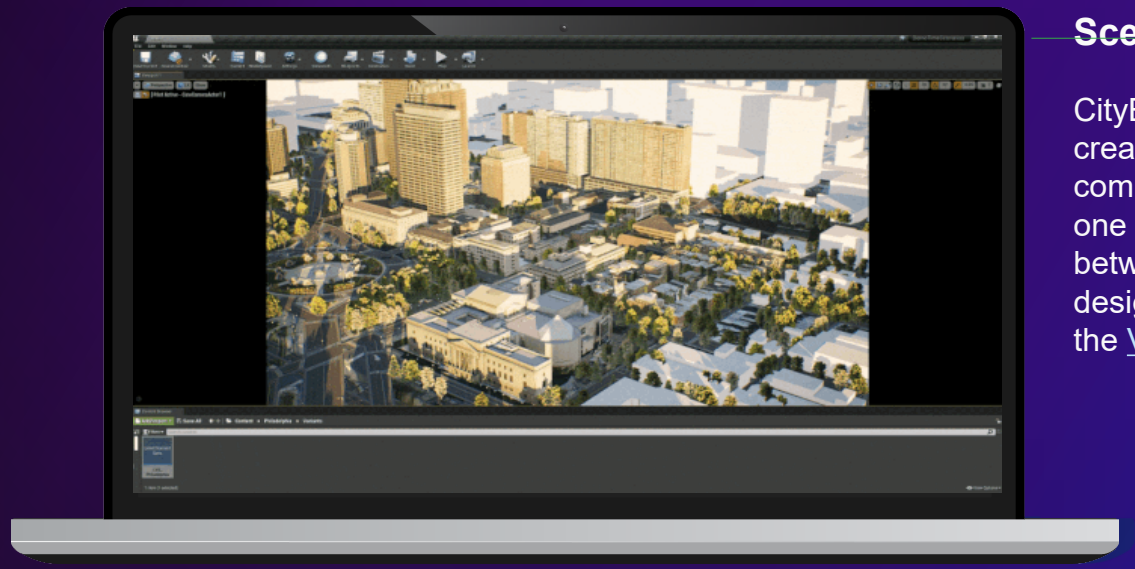
The new Adjust Position and Orientation tool option has been added to the Rotate, Scale, and Translate tools. This allows you to reposition and reorient the transform handle in order to perform advanced transformations. Snapping is also supported.

CGA: Footprints, roofs, materials, and local variables

New powerful geometry operations have been added to CityEngine's procedural modeling language CGA.

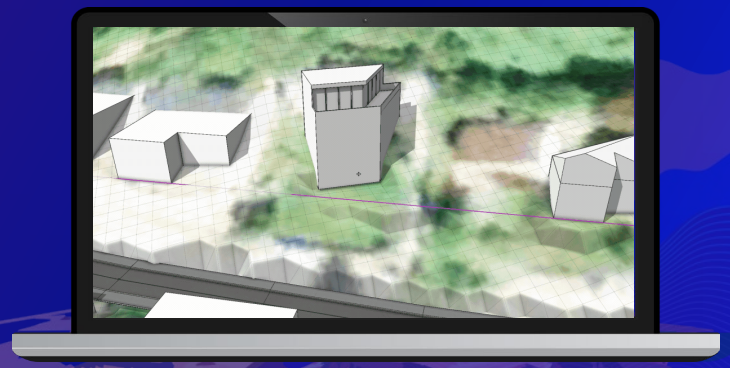
CityEngine Plugins for 3rd-party tools

Plugins available: Rhino, Unreal Engine, Maya, Houdini and PyPRT



Scenario-based design

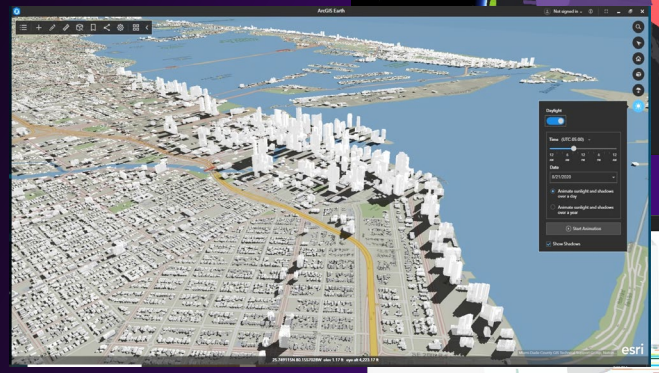
CityEngine allows for the intuitive creation, management, and comparison of Scenarios. With one click, you can switch between Scenarios and compare design alternatives in the Viewport and the Dashboard.



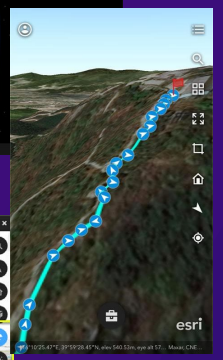
ArcGIS Earth Visualize, Edit, and Share in 3D

3D Symbology

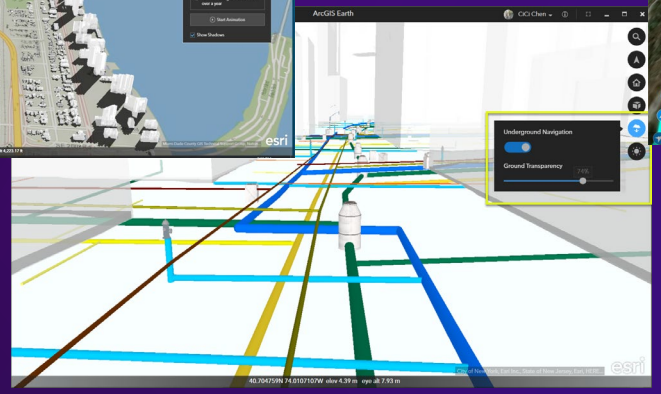




Dynamic Shadows



GPS Recording



Underground

New & Improved

- Configuration Management
- KML sharing to ArcGIS Online/Enterprise
- Custom symbology
- Enhanced 3D Visualization
- Accessibility
- Expanded developer experience

Coming

- Enhanced 3D visualization
- Better I3S support
- Additional data types
- Expanded mobile workflows
- Expanded Imagery workflows
- Additional coordinate systems

ArcGIS Earth is built on the ArcGIS Runtime SDK for .NET



- A Complete ArcGIS system for globe-based data exploration and communication

Native KML Editor with High-End 3D Analytical Capabilities

Scene Viewer

Enhancements to search, navigation, and rendering

Learn more: bit.ly/WSV2018-3

Try it out: arcg.is/yTSCe

Scene Viewer support feature layer editing!

Edit point, line and polygon feature layers with snapping, transformations and z geometry.

Elevation Profile Tool

Identify the elevation of drawn lines and existing features with the elevation Profile tool.

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

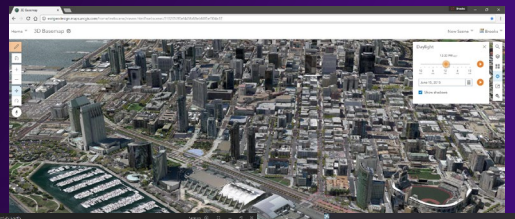
Improved Transparency

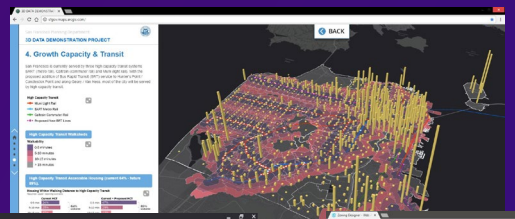
Order-Independent Transparency allows you to see transparent objects behind other transparent objects.

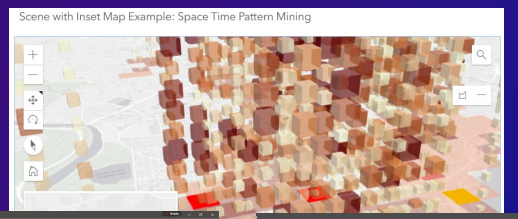


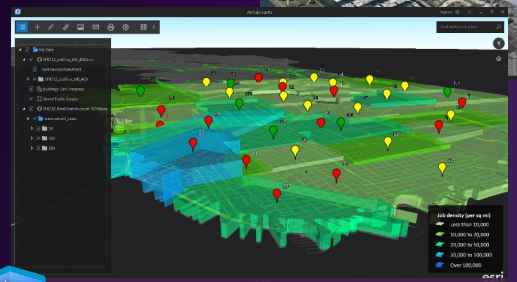


Apps | 3D Tools For The Field, Office, and Community

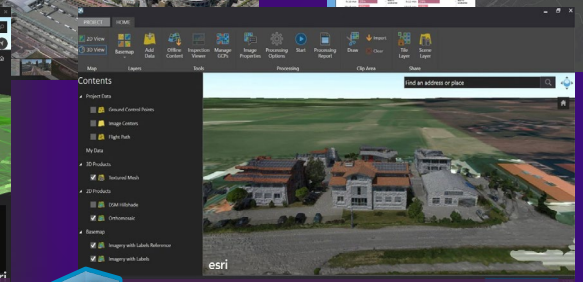




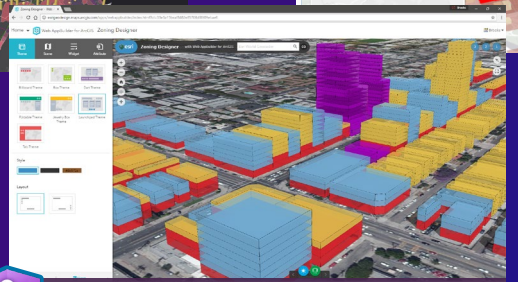




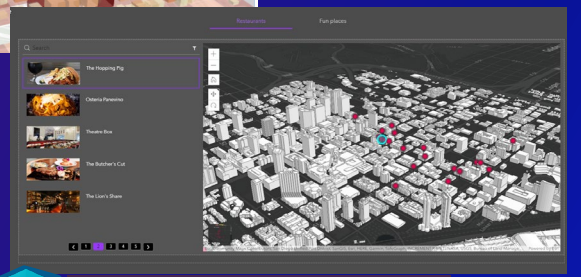
ArcGIS Earth



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

ArcGIS Urban

Orchestrate Urban Development and Planning Workflows



Immersive

Smart Cities

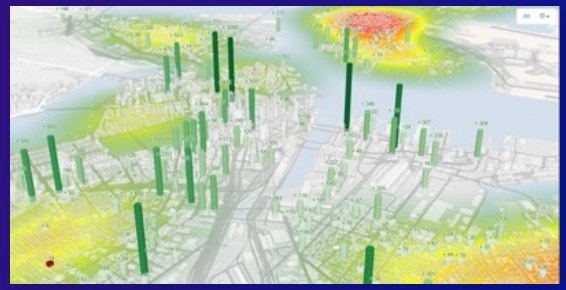
Collaborative



Track and Evaluate Projects



Create Planning Scenarios



Report and Engage

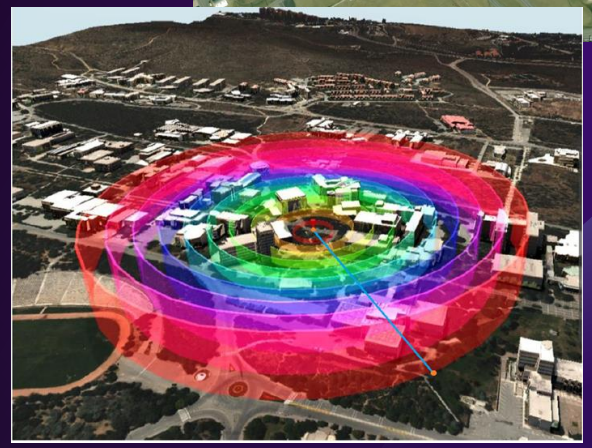
Stakeholders

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

What's coming next for 3D at Esri







UC

- 3D Editing in Scene Viewer
- Pop up Authoring in Scene Viewer
- Elevation Profile Tool
- Search Building Scene Layer
- Charting for Scene Layers in Experience Builder
- Faster voxel display
- Recook and reproject integrated mesh scene layers
- I3S SDK with Mesh LOD generation
- CesiumJS reading I3S
- 3D Instant App
- Clip and ship workflow for meshes

Mid term

- ArcGIS Earth write to feature services
- Savable Scene Layer symbology/configuration*
- Cloud file storage publishing for scene layers
- Open Street Map-derived buildings global scene layers
- 3D Object Feature Layer*
- Publishing 3D Object Scene Layer from 3D Object Feature Layer
- Panoramic Profile
- Cumulative Shadow Analysis

Long term

- 3D Support in Dashboards
- 3D Widgets in Experience Builder (LOS, Profile,Slice)
- Time-enablement/Time Slider in web scenes*
- Voxel Scene Layer for web sharing*
- Point Cloud data management for Scene Layers
- ArcGIS Earth API*
- Integrated mesh attributes
- Composite scene layer

Plans subject to change



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