



# 3D across the ArcGIS Platform

Chris Andrews | 3D Product Manager

# The experience of GIS is changing

## The GIS of the future is

- Mobile
- Immersive
- Visually compelling
- Real time/time aware
- Consumerized/User friendly
- Deep and Smart
- Scalable and Distributed

3D is the  
common visual  
and analytical  
experience for  
tomorrow's  
GIS



# Massive amounts of new data available

- Lidar from drones, trucks, backpacks, airplanes, and satellites
- High resolution, global-scale mesh created from aerial and satellite imagery
- Spherical and oblique imagery from consumer and industrial devices
- Underground information from millions of boreholes
- Large processing pipelines from Vexcel, Harris, and others
- Potential of IoT and indoor location

**UAV**

**Tiled  
Mesh**

**Indoor**

**Oblique**

**BIM**

**IoT**

**Spherical  
Imagery**

**FMV**

**LiDAR**

**4D**

# Core 3D Capability

Anywhere In Any Environment

- Use 2D and 3D GIS in a single GIS workflow
- Reuse dynamic services across clients
- Securely collect, manage, curate 3D data
- Conduct analysis across real-time and historical data
- Create tailored experiences for different types of users

Cross-platform

Open

Accessible



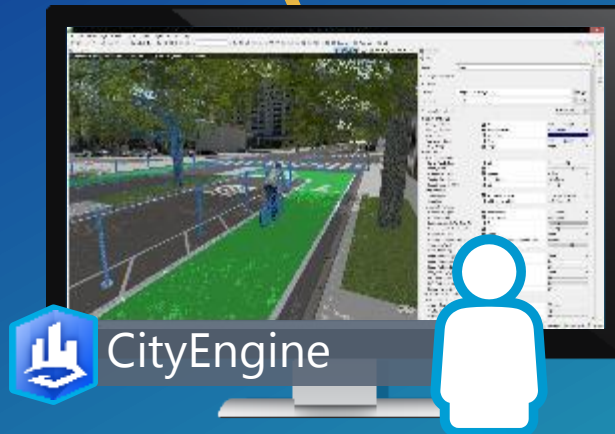
# Desktop

## Professional 3D GIS



### Powerful 2D/3D desktop authoring and data management

- 3D streaming for global and local scenes
- Rich spatial analysis for advanced 3D workflows
- LiDAR classification, feature extraction and editing
- BIM (IFC) and KML (KMZ) interoperability support
- ArcGIS Pro SDK for Microsoft .NET to extend workflows



### Advanced authoring tool for Urban Design

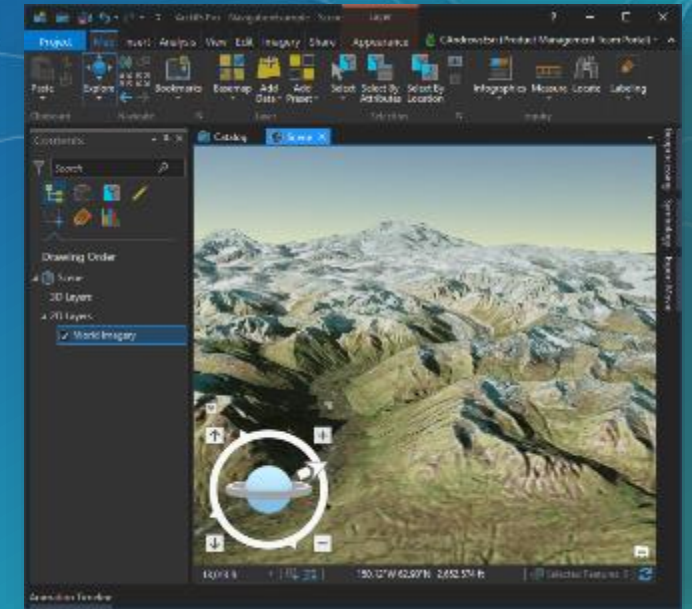
- Interactive design/modeling tools
- Procedural rule authoring
- Dynamic 3D streets and blocks
- Virtual reality with ArcGIS 360 VR

### ArcGIS Extensions

-  3D Analyst
-  Spatial Analyst
-  Network Analyst
-  Data Interoperability

# ArcGIS Pro | 3D navigation

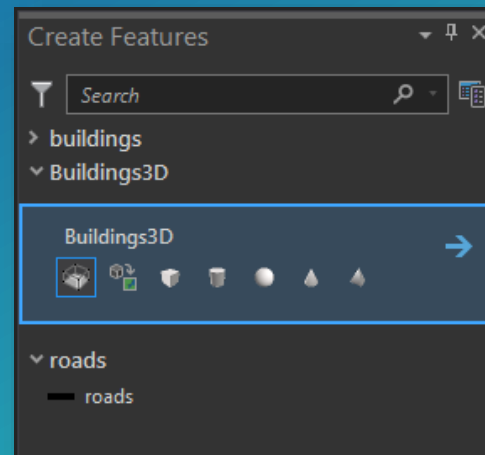
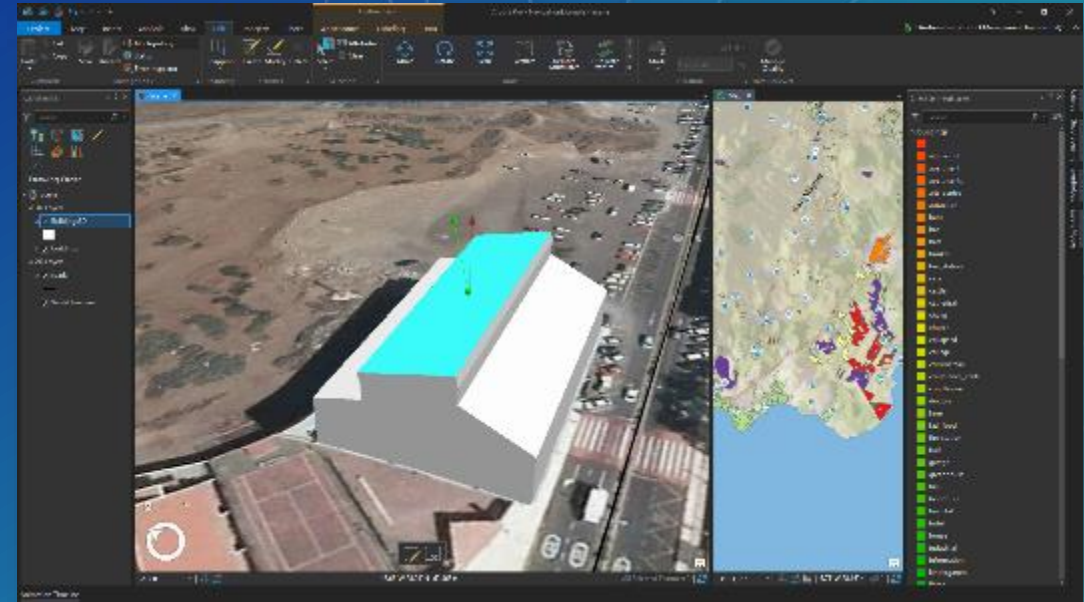
- Underground navigation
- 3D navigation control
- Dynamic view linking 2D-3D or 3D-3D





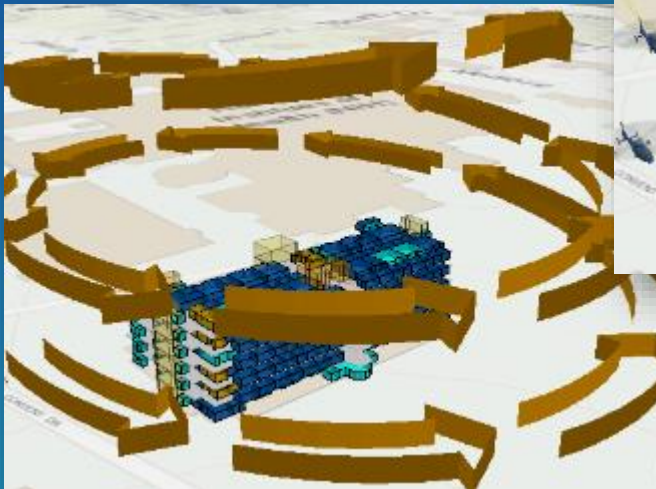
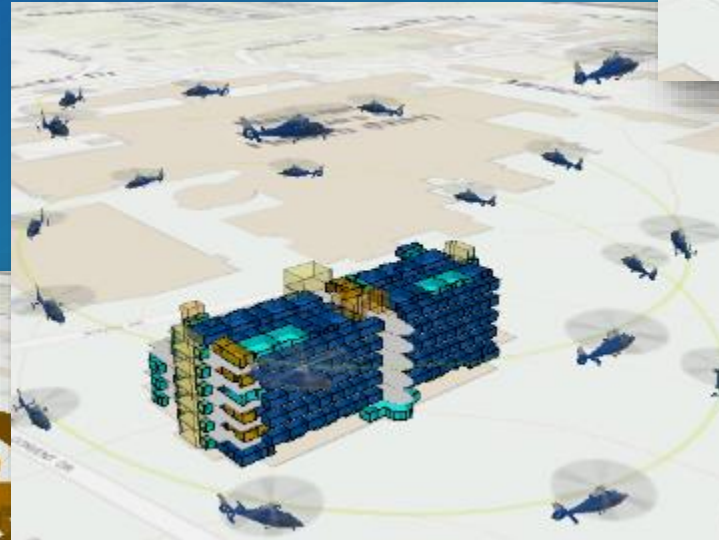
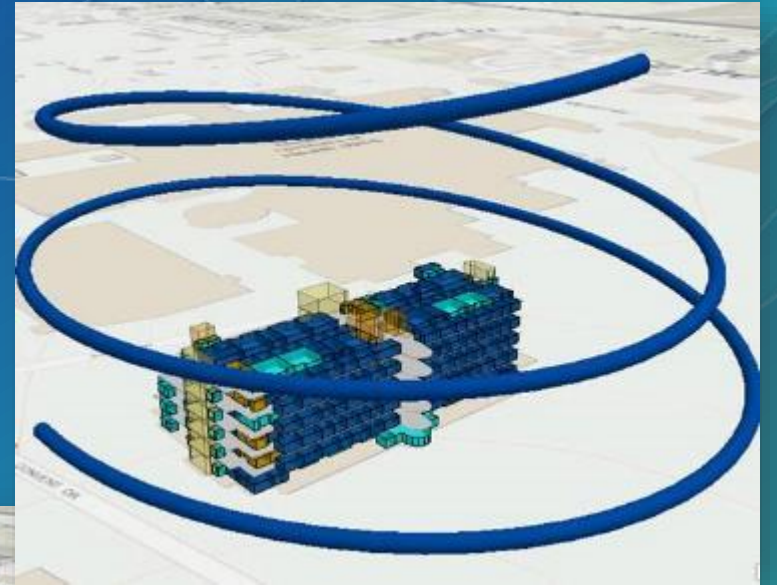
# ArcGIS Pro | 3D editing

- Create new 3D objects
- Geometric shapes
- Snap to scene layers
- Apply procedural rules
- Use standard OBJ, DAE formats



# ArcGIS Pro | 3D cartography

- Geometric Effects in 3D
- Advanced cartographic options
  - Military, Scientific



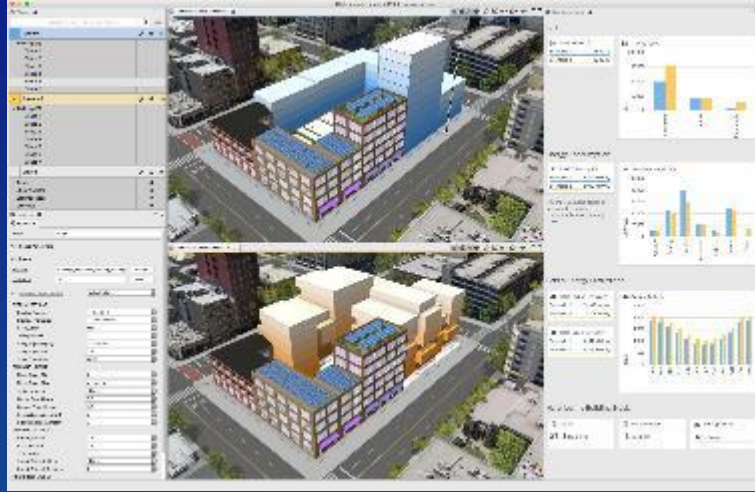


# ArcGIS Pro | Storytelling with Animation

- Create rich animations with 3D content, overlays
- Use Range and Time
- Screen overlays
  - Placement
  - Text and imagery content
  - Timing
- Use geodesic paths

# CityEngine 2017 | New capabilities

Scenarios



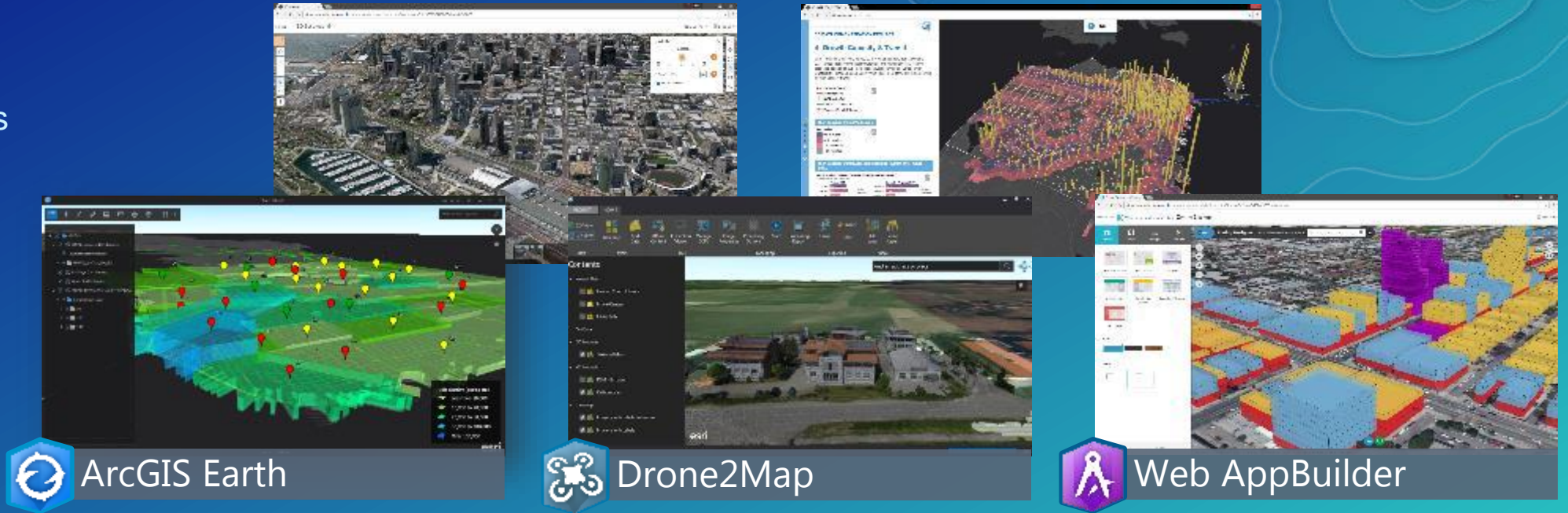
Context Queries

CGA Enhancements for Zoning

Local Edits

3D Measure

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



ArcGIS Earth	Easy-to-use 3D data exploration for Enterprise users
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
Story Maps	Combine 3D maps with narrative text, images, and multimedia content



# ArcGIS Earth | 1<sup>st</sup> Year

- Earth launched in production Jan 2016
- Focus on innovation, agility and customer feedback
- Releasing quarterly
  - 4 releases since UC 2016
- Free for download

# ArcGIS Earth | Consistent experience for desktop users

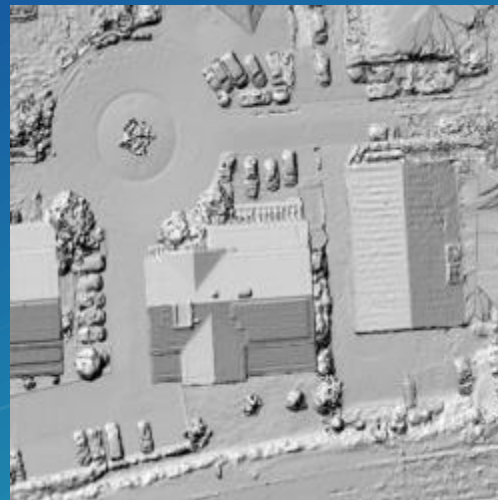
- Browse Online/Enterprise
- Authenticate with PKI, IWA
- Add local data
- Navigate
- Use KML
- Configure and personalize



# Drone2Map | Create 2D and 3D products from drone imagery



**Orthomosaics**



**Digital Surface Models**



**Point Clouds and Meshes**

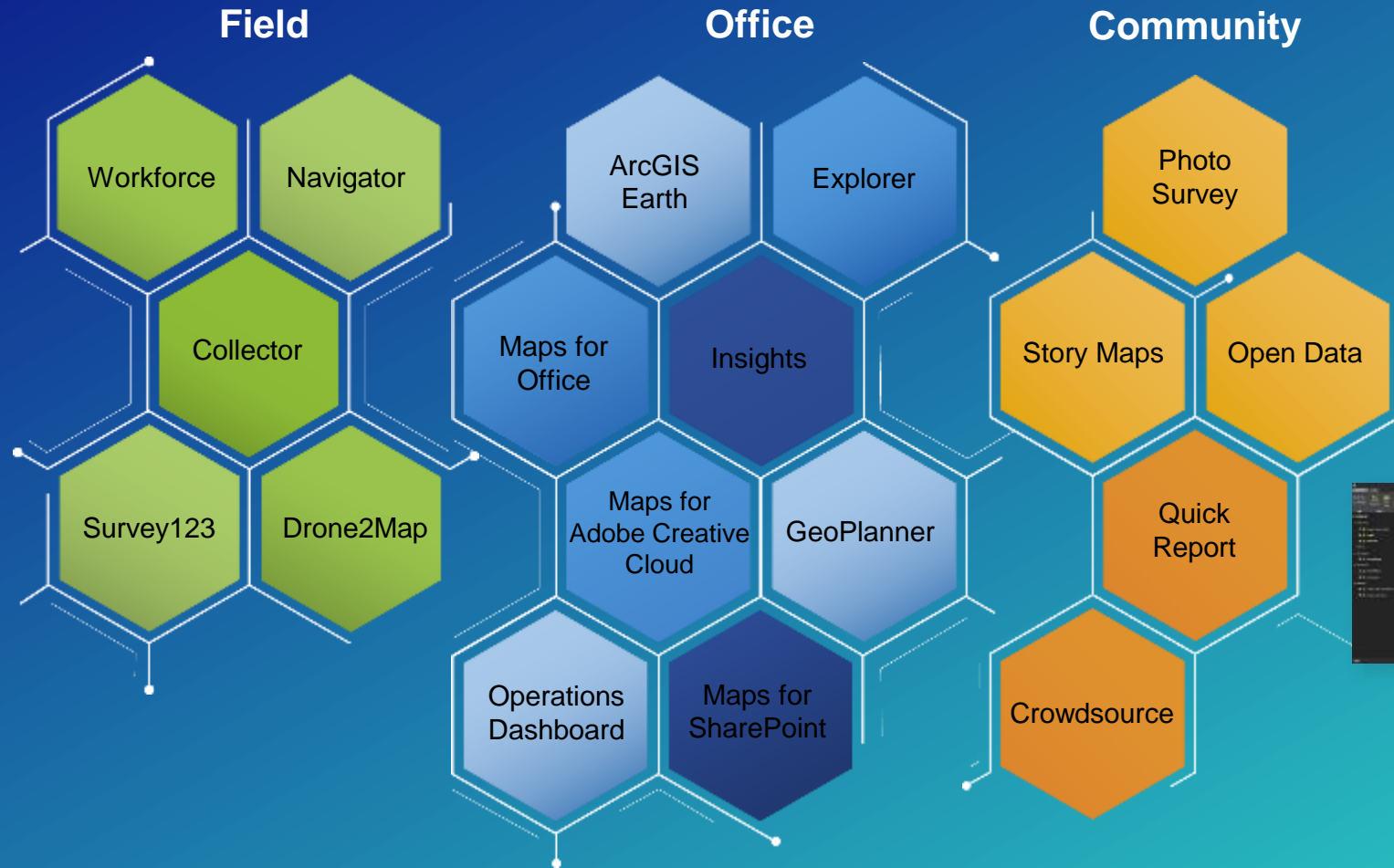


**Smart Inspection**



# More Apps

Extending Industry Specific Workflows



# Enterprise

Hosted 3D In The Cloud and/or On-Premise



## Enterprise data and services

- Web Scene
  - Vehicle for cross-platform 3D capability
  - Collection of layers, environment settings, slides, animation
  - Essential for 3D apps on any platform or experience
- Scene Layer
  - Scalable cache of graphics, styles, and attributes
  - 3D Objects, 3D Points, Integrated Meshes, Point clouds

ArcGIS Online

Content and services for sharing ideas in 2D and 3D

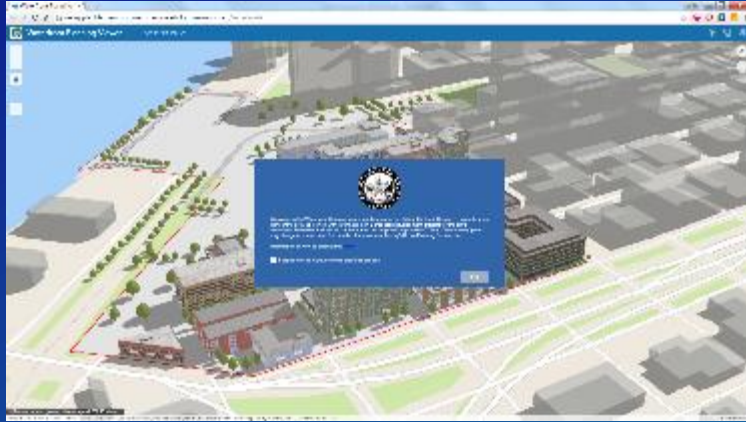
ArcGIS Enterprise

Scalable 2D/3D enterprise content distribution and geoprocessing

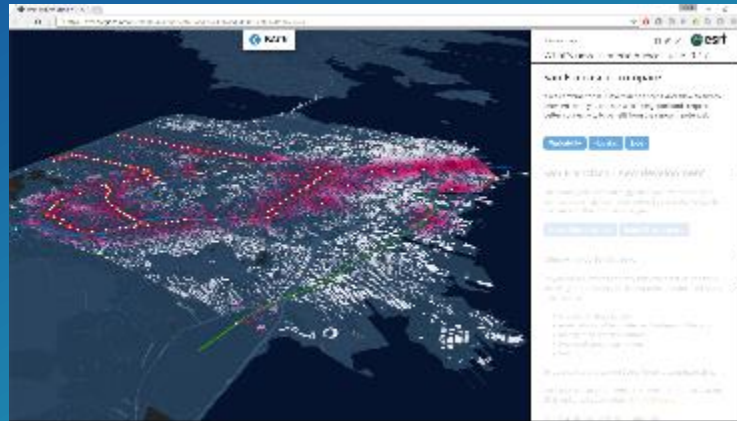
GeoEvent Server

Connect and manage real-time information (IoT)

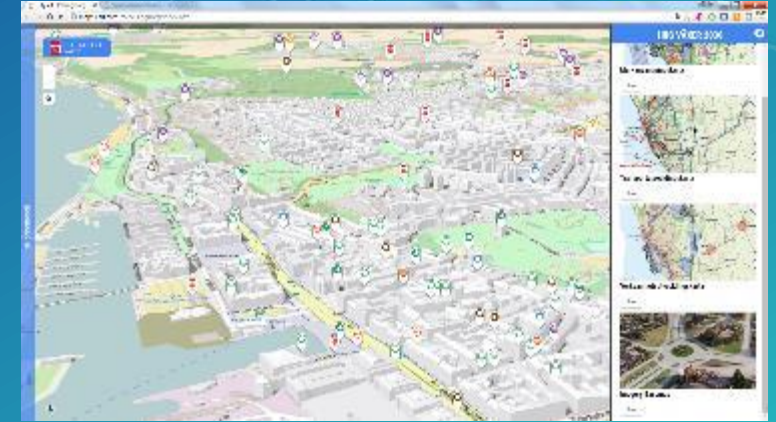
# More ways to use scenes



Web AppBuilder



Story Maps

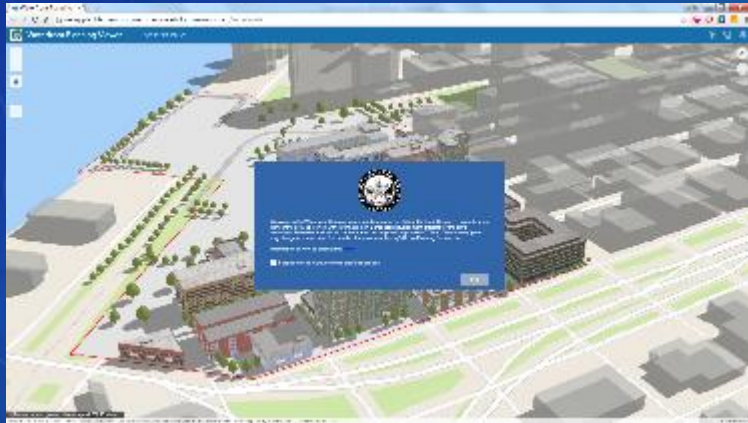


JS API Custom apps

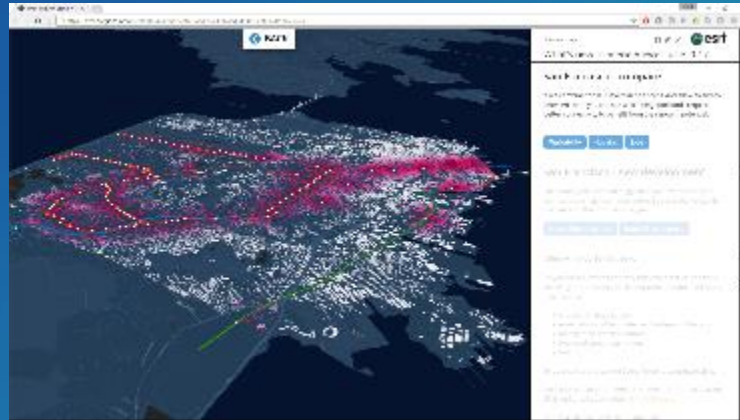


# 3D in JavaScript | From API to configurable apps

- WebGL 3D experiences that run in a browser with no plug-in
- Customize, configure, or use out-of-the-box experiences
- Combine 2D and 3D content from your Organization with Living Atlas data



Web AppBuilder



Story Maps



JS API Custom apps

# Standards

Enabling customers & partners through sharing and integration

Open Software, Standards and Data enable organizational resiliency

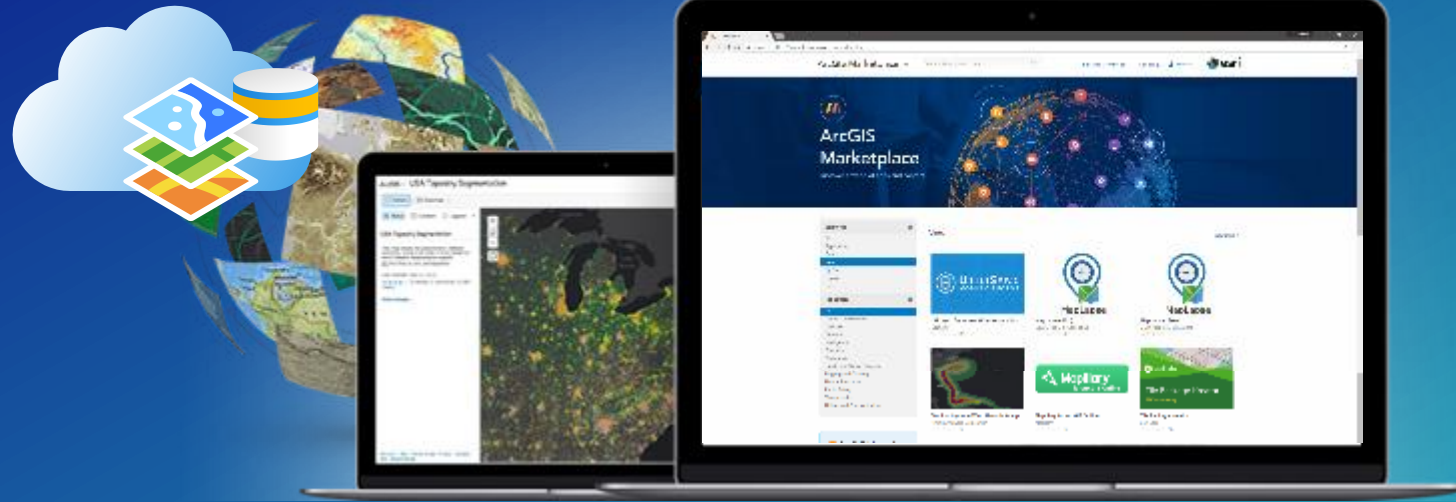
- Ensure access to data
- Guarantee interoperability
- Enable innovation
- Encourage usage and adoption



I3S	Scalable 3D scene content for visualization and distribution
LERC	Raster (imagery and elevation) compression technology for 2D and 3D
GeoREST	Esri open REST APIs for access to any kind of GIS content and services

# Content

## Esri and 3<sup>rd</sup> Party Partner Content



### Ready-to-Use Maps and Data

- Global Coverage
- Compiled from Best Available Sources
  - Basemaps
  - Imagery
  - Demographics
  - Landscape
- Tens of Thousands of Open Datasets

ArcGIS Marketplace

3<sup>rd</sup> party geospatial apps and data from Esri's global Partner Network

Living Atlas

3D and 2D content for use throughout mapping applications



# Developer Tools

Development and Scripting Tools For Extending/Customizing

Android  
Java  
C#  
Web  
.NET  
C++  
Swift  
Xamarin  
Objective-C  
HTML5  
REST  
JavaScript  
QML  
Python  
Qt  
Windows  
Apple



Reduce Development Costs

- 3D Everywhere
- Vector Tiles
- Smart Mapping
- Leverage User Roles
- Data Flows Between Apps

ArcGIS Runtime SDKs

Developer tools for 2D and 3D native iOS, Android, Windows solutions

ArcGIS JavaScript API

Developer toolkit for building and extending 2D and 3D web apps

# Enterprise workflows



## Large Enterprises

Exploring data securely on premises

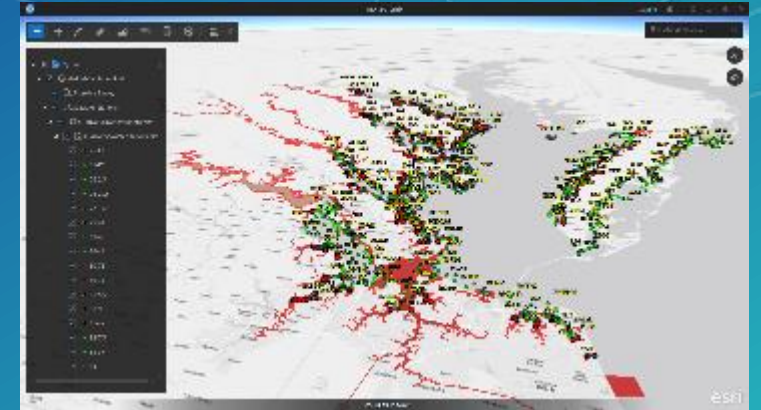
Law enforcement, federal agencies & large companies need to explore information across large areas using 3D GIS behind a firewall



## Small Enterprises

Sharing 3D using ArcGIS Online

City planners, urban designers, and small AEC firms want to create and share plans and status with constituents in 3D



## Hybrid scenario

3D with large data packages in connected and disconnected workflows

Program management agencies, emergency managers, and utilities agencies need to use 3D within the organization for planning and to share with collaborators in the field to plan, respond and act



# CAD, BIM, and GIS

3D Virtual Construction





## The Future of Resilience

# 75% of the Infrastructure That Will Exist in 2050 Doesn't Exist Today

BY AURORA ALMENDRAL | OCTOBER 22, 2014



# BIM is a process for increasing efficiency throughout the construction process

GSA U.S. General Services Administration

WHAT GSA OFFERS | DOING BUSINESS WITH GSA | LEARN MORE | BLOG

Home > Builders & Real Estate > Design & Construction > 3D-4D Building Information Modeling >

## 3D-4D Building Information Modeling

In 2009 the General Services Administration (GSA), through its Public Buildings Service (PBS) Office of Capital Buildings (OCB), initiated the Builders 3D-4D BIM Program. OCB has led over 30 projects in its capital program, and is reviewing and supporting new commercial (CIC), governmental (GIC), and Building Information Modeling (BIM) applications in over 100 projects to date across the nation. The power of visualization, coordination, simulation, and collaboration from 3D, 4D, and BIM computer technologies allow GSA to more effectively meet customer, design, construction, and program requirements. GSA is committed to a strategic and incremental adoption of 3D, 4D, and BIM technologies.

There is a progression from 2D to 3D, 4D, and BIM. While 3D models make valuable contributions to construction, not all 3D models qualify as BIM models since a 3D graphic representation is only part of the BIM process.

Efforts to increase the impact of construction models, who project coordination, and collaboration in the modern building process.

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**3D-4D BIM Overview**  
Spatial Program Integration  
3D-4D User Training  
3D Planning  
Energy Performance and Operations  
Visualization and Design  
Workflow  
Facility Management  
BIM Operations  
BIM Programs in The News  
BIM Video  
3D Modeling List

## Russia following UK's lead with plans for BIM mandate

By [Kim Slowey](#) | September 16, 2016



## TIPS ON MEP AND STRUCTURAL BIM E-SUBMISSION

Towards a smoother and simpler approval process

## Updates on Mandatory BIM e-Submission

Article Talk

## SOSI

From Wikipedia, the free encyclopedia

**SOSI** is a much used **geospatial vector** data format for predominantly used for exchange of geographical information. SOSI is short for **Samordnet Opplegg for Stedfestet Informasjon** (literally "Coordinated Approach for Spatial Information" expanded in English to **Systematic Organization of Spatial Information**).

The standard includes standardized definitions for geometry and topology, data quality, coordinate systems, and metadata.

The open standard was developed by the Norwegian Mapping and Cadastre Authority. It was first published in 1996.

1. From July 2013, BIM e-submission for regulatory approval would be made mandatory in three phases: new building projects with a Gross Floor Area (GFA) of more than 20,000 m<sup>2</sup>, which are submitted to the Urban Redevelopment Authority (URA) for planning approval on or after 1 July 2013, are required to submit their architectural plans in BIM format.
2. From 1 July 2014, there will be mandatory structural and Mechanical, Electrical and Plumbing (MEP) BIM e-Submission for all new building projects with GFA of 20,000 m<sup>2</sup> and above (in 2013 and 2014).
3. From 1 July 2015, companies are also required to make architectural, structural and MEP BIM e-Submissions for all new building projects with a GFA of 5,000 m<sup>2</sup> and above (in 2015).

NEWS

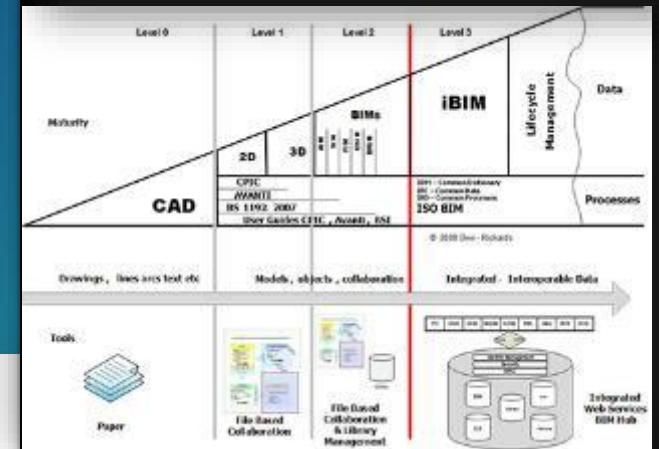
## FRANCE AND GERMANY MOVE FORWARD ON BIM ADOPTION

## Cameron Gov't Requires BIM Construction Procurement for UK Public Projects by 2016

by Jeff Yoders on MAY 28, 2014

Style: Commentary Category: Manufacturing, Public Policy, Sourcing Strategies

Across the pond, a revolution in construction procurement and supply chain logistics is happening with a goal of reducing greenhouse gas emissions and unlocking process efficiencies that can create better buildings and better-followed budgets.

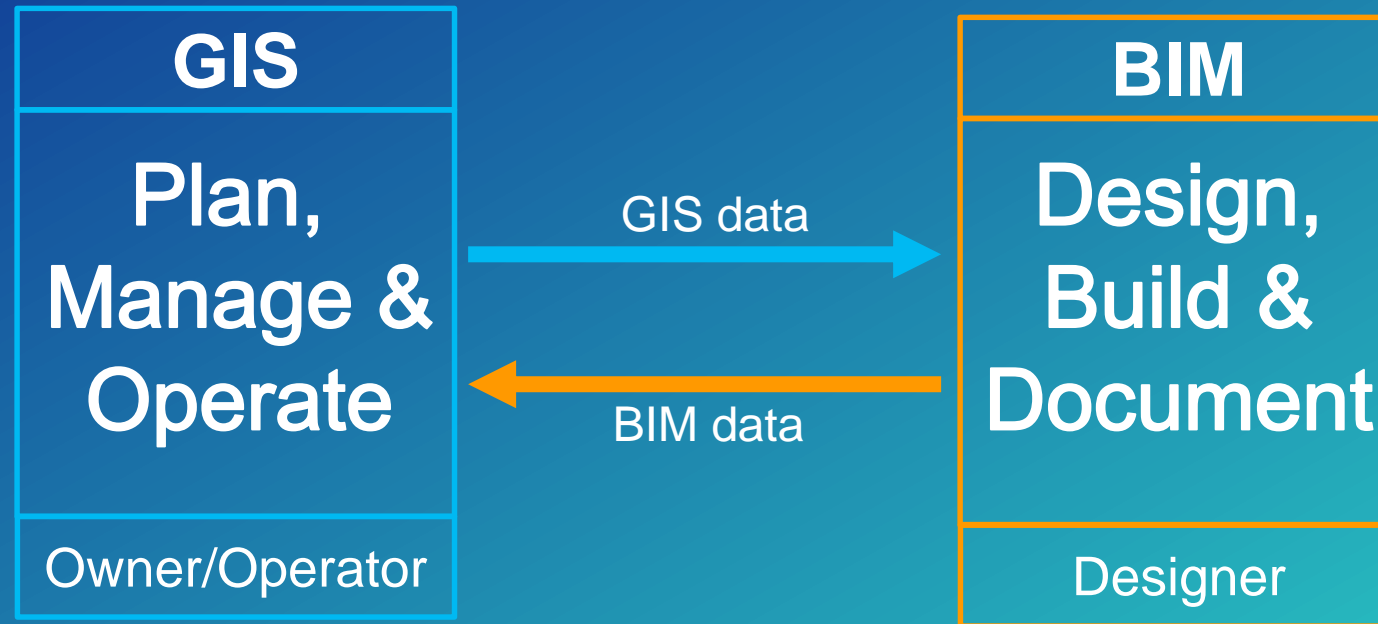


# BIM + GIS

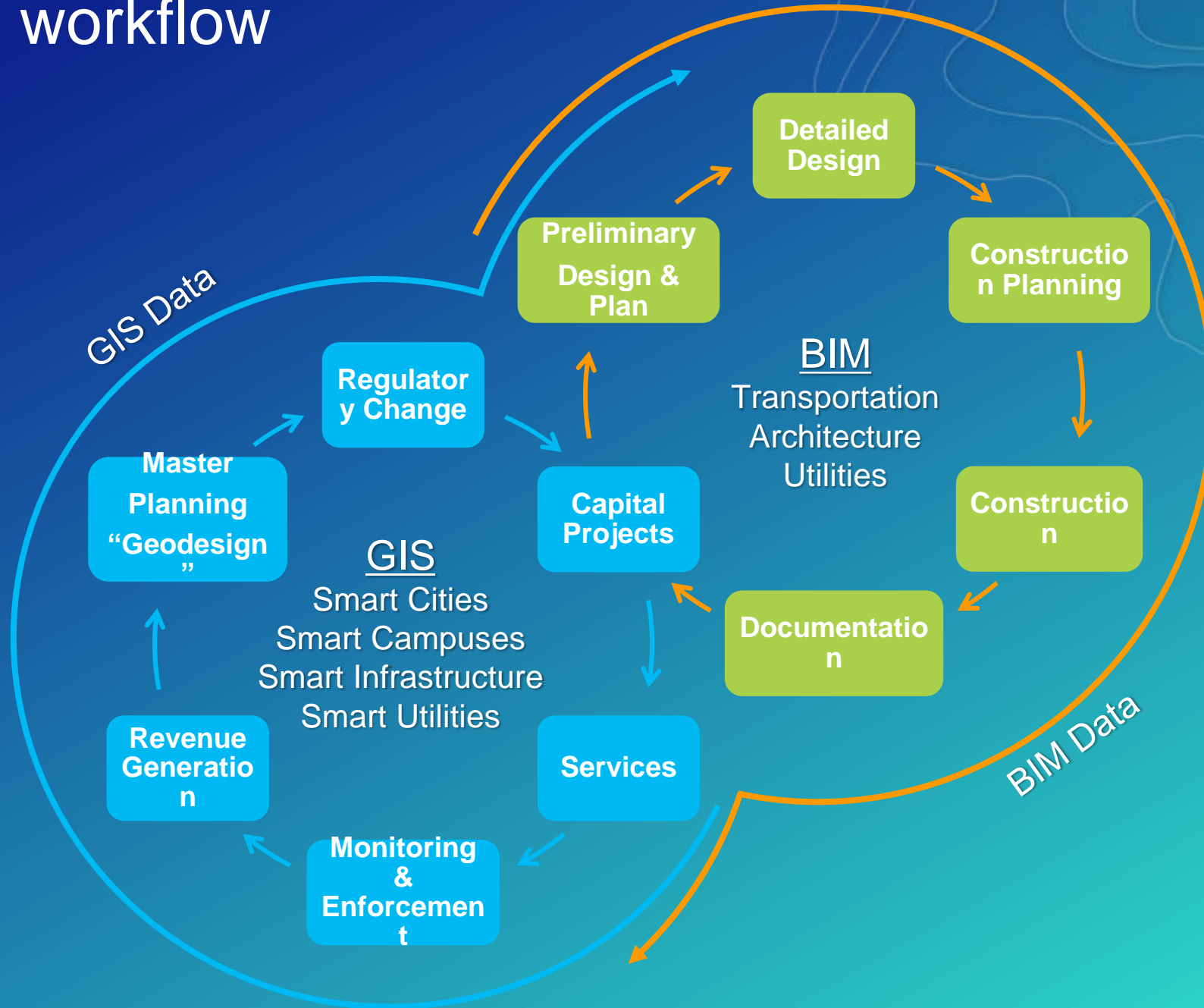
Changing the way cities and utilities design,  
build, and manage resilient infrastructure



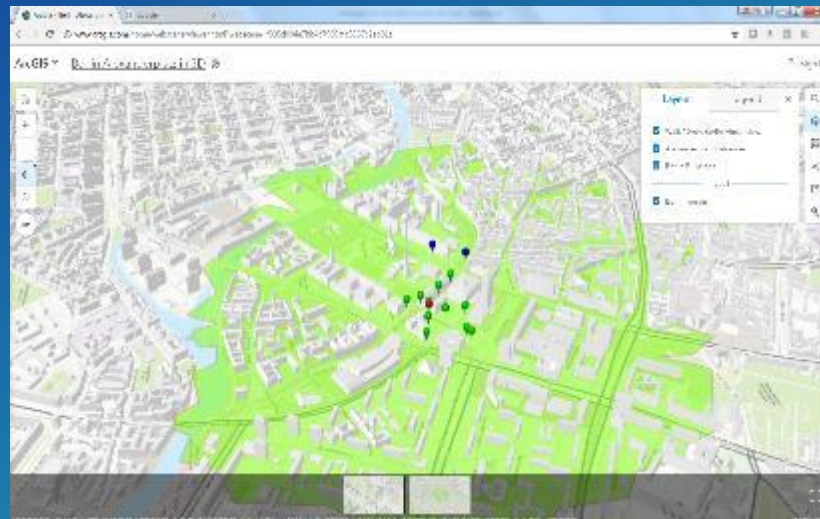
# High-level GIS-BIM workflow



# GIS-BIM workflow overlap



# BIM as Features



# BIM Visualization





VR / AR / MR

# VR/AR/MR research

- Core capability vs. app vs. toolkit
- AR and VR as Esri Labs projects
- MR as research (Hololens)
- Challenge: Game engine-type performance (90 fps)



# ArcGIS 360 VR

- VR experience
  - Simple creation of mobile VR demos for non-expert user experience
  - Quick immersion into design to experience impact of projects and proposals
- VR application for Samsung Galaxy
  - Adding Google Daydream (Cardboard experiences)
  - Additional support for viewing by a web app
- Currently an Esri Labs project



# AuGeo

- AR experience
  - Easy-to-use iOS and Android app to demonstrate Augmented Reality
  - Display of point feature service information around the user's location
- Currently an Esri Labs project
- Built with AppStudio for ArcGIS
  - Source code planned to be released at UC

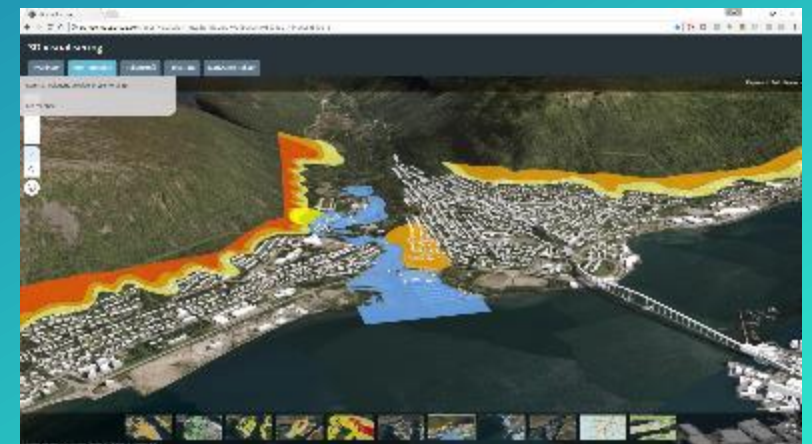
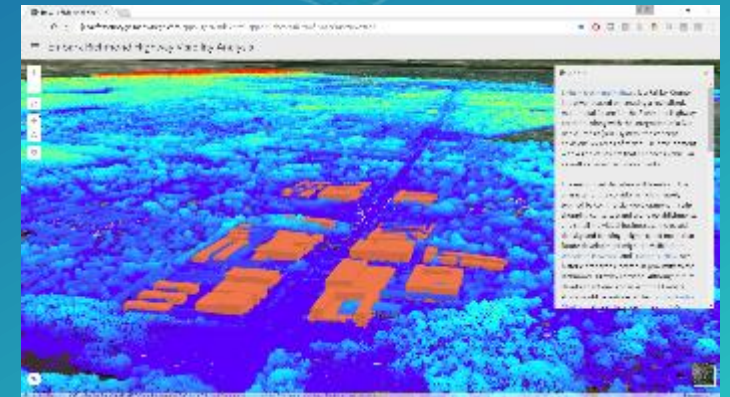
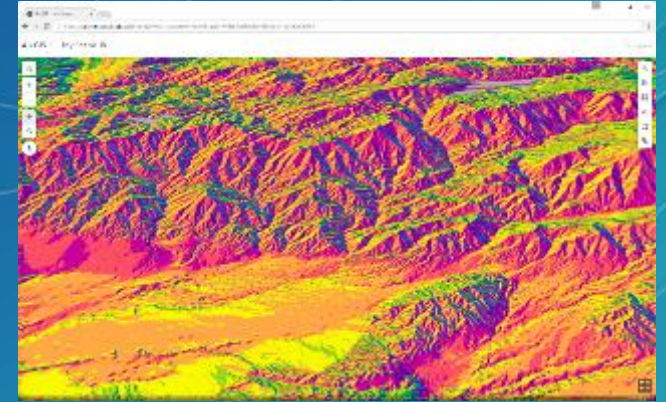


Wrap up



# 3D in Esri today

- Create and manage 3D content
  - Point clouds, meshes, 3D objects, and 3D vector data
- Use Living Atlas elevation and imagery
- Host 3D content in ArcGIS Online or on premises
- Author 3D experiences across platforms
- Use open specifications (I3S) to distribute data
- Communicate with stakeholders through
  - Animation
  - Free web apps
  - Free desktop apps
- Build custom JavaScript and native apps





# Future of 3D in ArcGIS

BIM-GIS interoperability

Visual effects

Ease of use

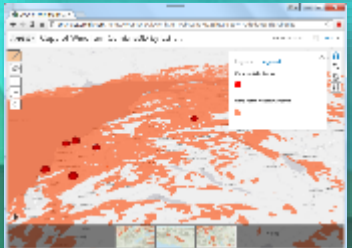
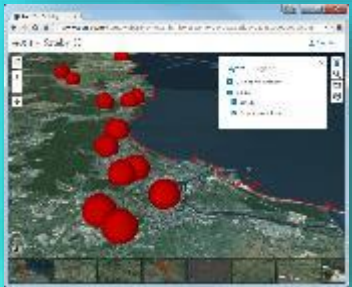
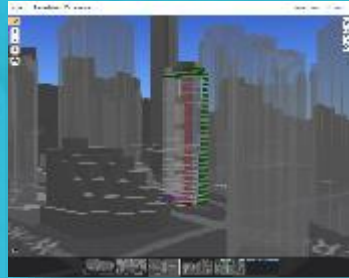
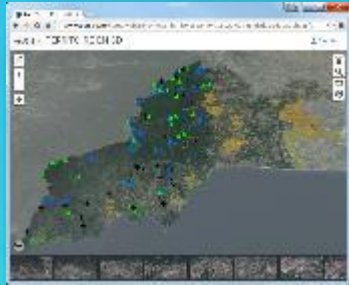
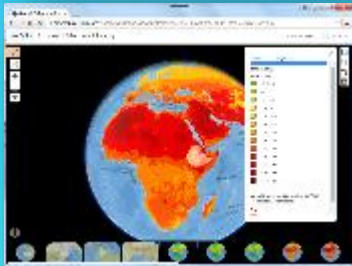
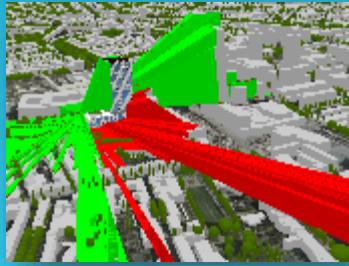
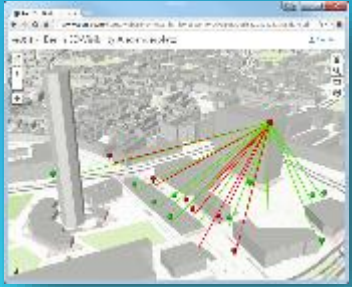
Interactive analytical tools

3D editing

Mobile 3D

Real-time and Big Data for immersive 3D

Augmented Reality / Virtual Reality





esri

THE  
SCIENCE  
OF  
WHERE