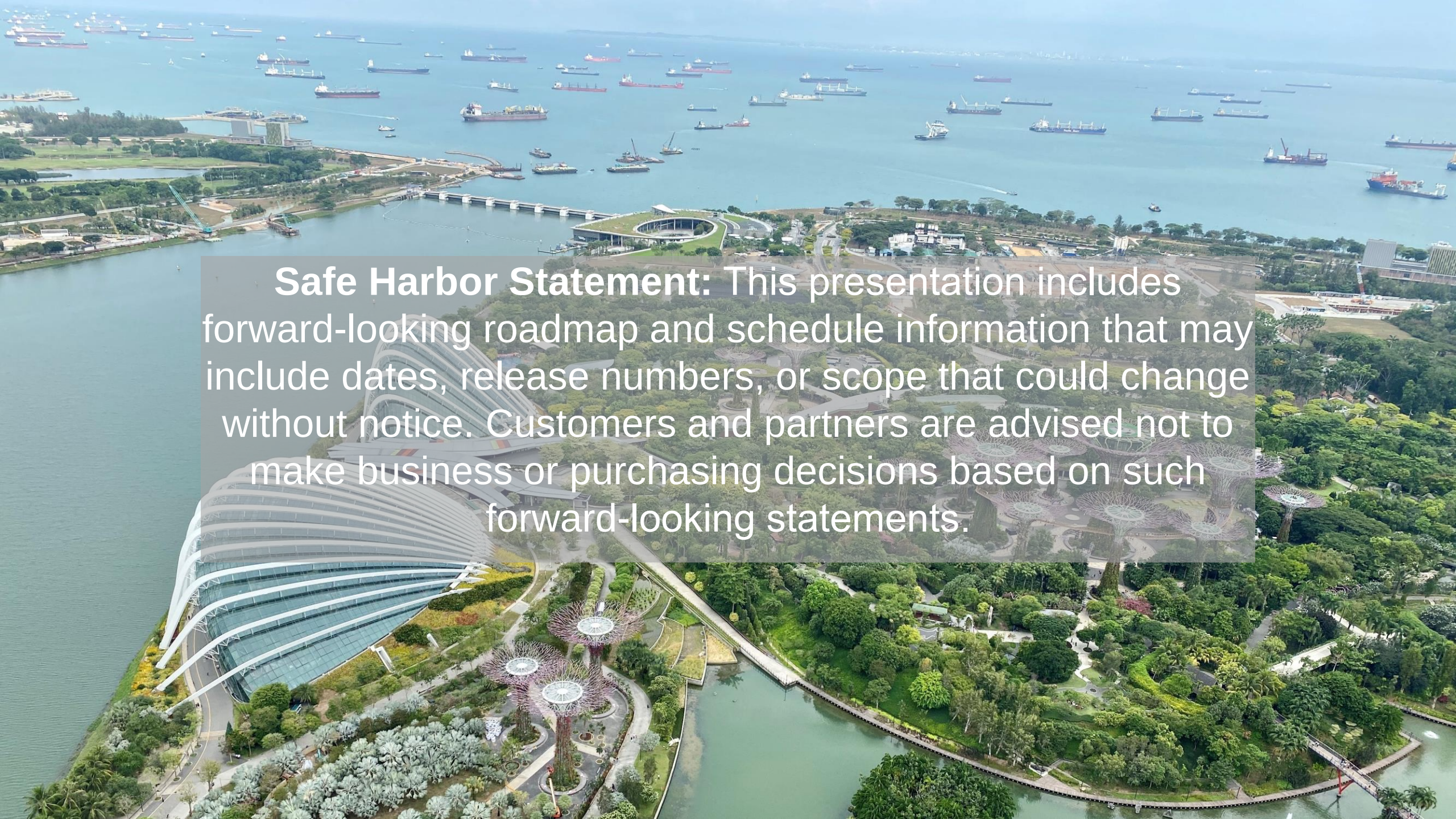
CAD, BIM, and GIS – Linking Design with Context to Drive Life Cycle Value

Chris Andrews | Group Product Manager – GeoEnabled Systems, Smart Cities, 3D
Anthony Renteria | Product Manager – ArcGIS GeoBIM & AEC
Thomas Warner | Solution Engineer – National Government's Defense Team

2021 ESRI FEDERAL GIS CONFERENCE

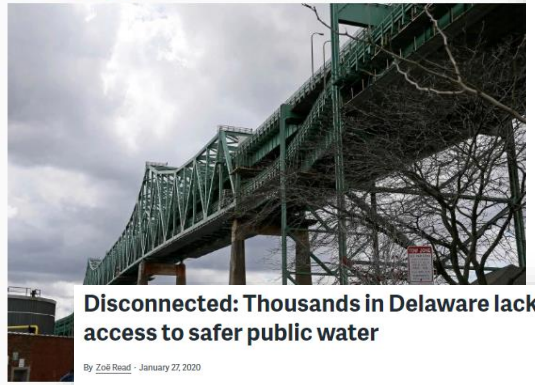


Safe Harbor Statement: This presentation includes forward-looking roadmap and schedule information that may include dates, release numbers, or scope that could change without notice. Customers and partners are advised not to make business or purchasing decisions based on such forward-looking statements.

The Case for BIM + GIS

Global opportunities to help implement change

Bold thinking needed to bring Mass. transportation into future



Garbage Trucks And Potholes: San Antonio Launches Research And Development Program To Solve Problems

By PAUL FLAHIVE • JAN 28, 2020

Share Tweet Email

"City Hall To Go" is one of the R&D League's initiatives outreach and intake efforts overlap and to ailan those low-income, h

OFFICE OF INNOV

The world needs to build more than two billion new homes over the next 80 years

February 28, 2018 9.29am EST

Shutterstock

Email

By the end of this century, the world's population will have increased by half – that's

e global population is set to reach ov

opulation which was estimated at the

e "medium growth".

MI6 floor plans lost by building contractor

27 December 2019

Share

headquarte

U.S. Cities Vowed To Have More Mass Transit By 2020. Most Are Still Waiting.

January 9, 2020 | Cameron Sperance, Bisnow Boston

Facebook Twitter LinkedIn Email Print

Planners in many U.S. cities benchmarked 2020 as the year transit plans would get rolling down the tracks.

Master plans and vision studies proclaimed regional transit networks would expand, easing congestion and efficiently zipping residents to and from their jobs and homes in growing metropolitan areas like Austin, Columbus and Nashville.

Let's Move Nashville was a nearly $9B plan to add light rail and bus rapid transit across Music City. Transit advocates hoped Project Connect would bring light rail to Austin, ranked the worst city in Texas for traffic congestion.

But 2020 is here and, despite booming economies, these cities aren't any closer to solving their traffic misery — and that could threaten their growing real estate markets.

Disconnected: Thousands in Delaware lack access to safer public water

By Zoë Read - January 27, 2020

Listen 5:44

Consuelo McGowan from SERCAP collects samples for testing at a mobile home in Ellendale, Del. McGowan works for a non-profit that provides kits for testing well water. (Zoe Read/WHYY)

Salt Lake City braces for traffic problems as five skyscrapers rise amid a wave of downtown construction

(Francisco Kjolseth | The Salt Lake Tribune) Captured during a recent timed exposure, the intersection of 200 S. and West Temple where work has begun on the 26-story Hyatt Regency convention center hotel, is about to become difficult to navigate. With at least six major construction projects unfolding this year in the state's urban core — five skyscrapers and the historic renovation of the Salt Lake Temple — key arteries feeding the heart of the city are expected to be congested, with lane closures and heavy truck traffic.

Infrastructure After COVID-19: Risk Of Another Lost Decade Of U.S. State Government Capital Investment

View Analyst Contact Information

Table of Contents +

Key Takeaways

- If state and local government infrastructure investment had continued at the rate prior to the Great Recession, $1.5 trillion more in infrastructure spending would have occurred in 2009-2019.
- In the decade following the Great Recession, state governments devoted significantly less of their budgets to capital spending and reduced their overall debt burden.
- As COVID-19 restricts consumer travel, billions of transportation activity-derived revenues that fund capital projects are at risk.
- Federal stimulus was vital following the Great Recession to prevent steeper declines in capital spending, but there is no agreement on a new comprehensive infrastructure spending plan.

S&P Global Ratings' analysis of the decade following the Great Recession shows a decline in state capital spending and infrastructure investment. This new paradigm was due to a number

SMART UTILITY

Energy Industry Gets Cracking on New Challenges

The task is cut out for planners, engineers, operators and protection folks.

Mark Johnson
MAR 08, 2019

Business drivers for BIM-GIS integration

Increase project efficiency

(Cost competitiveness)

Move to new business models

(EPC)

Decrease risk

(Regulatory compliance)

Extend capabilities (Managed services)

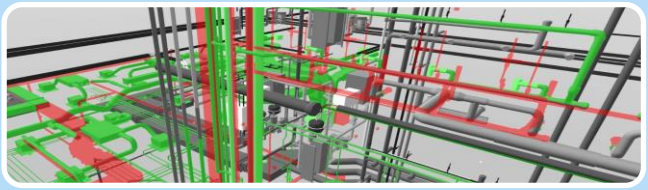
Increase competitiveness

(Portfolio sales)

Customer demand

BIM-focused AEC market is filled with geospatial opportunity

Planning



Design

Construction

Program Management

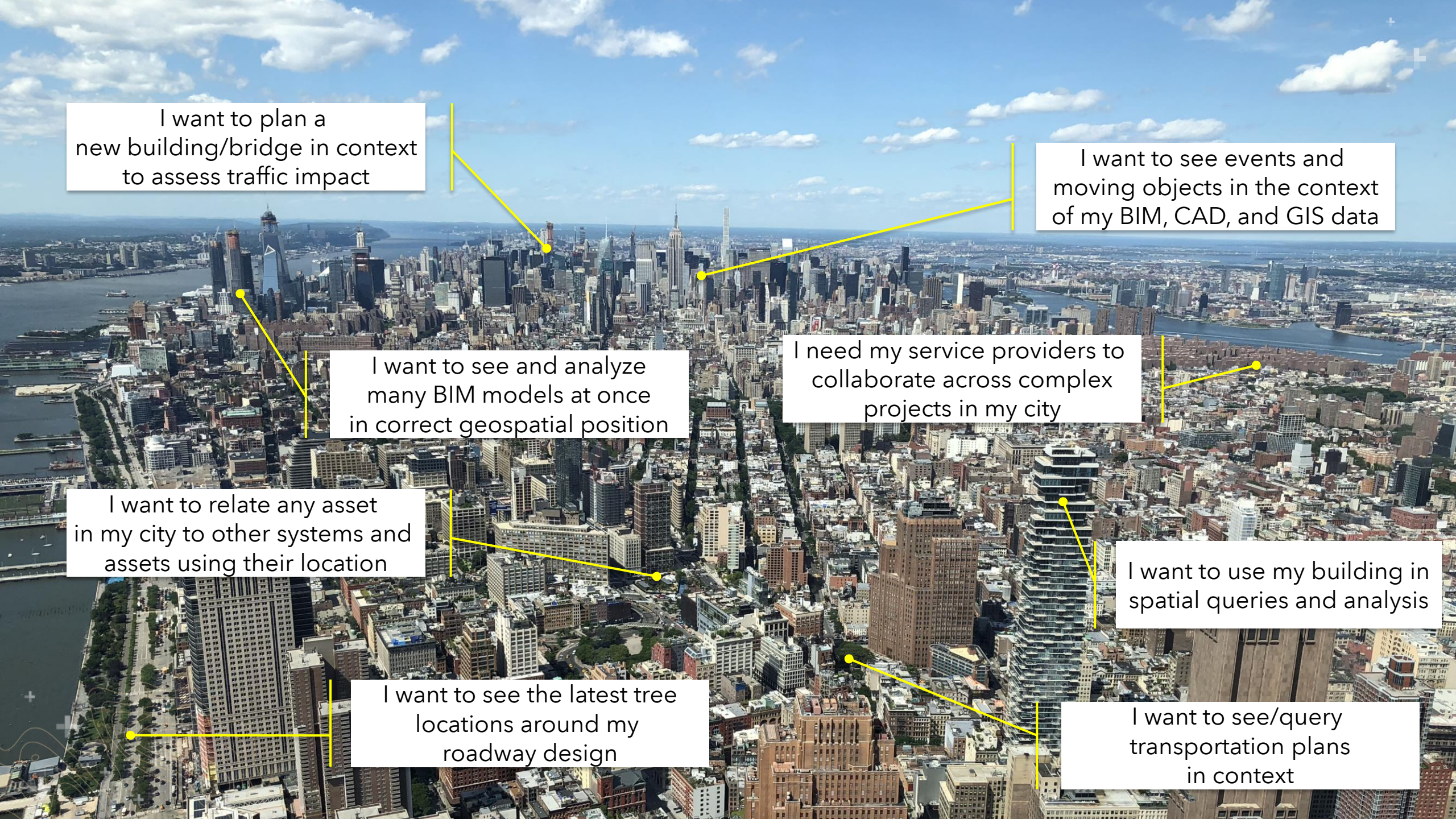
Maintenance

Operations

Imagine that you manage a large urban environment…

Now imagine needing to implement change in that environment…

GASLAMP STRIP CLUB


I want to plan a new building/bridge in context to assess traffic impact
I want to see events and moving objects in the context of my BIM, CAD, and GIS data
I want to see and analyze many BIM models at once in correct geospatial position
I need my service providers to collaborate across complex projects in my city
I want to relate any asset in my city to other systems and assets using their location
I want to use my building in spatial queries and analysis
I want to see the latest tree locations around my roadway design
I want to see/query transportation plans in context

BIM supplies detailed information about assets

GIS provides information about assets in the context of the built and natural environment

Our World is Transforming

Abstracting and Modeling Real World Assets and Systems to create high value Digital Assets

Facilities & Structures

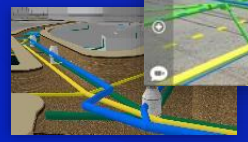
Buildings / Indoors

Plants / Structures

Networks

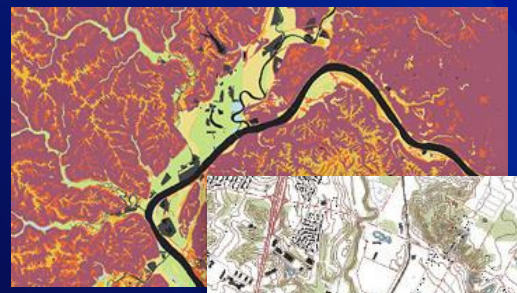
Utilities / Telecom

Pipelines

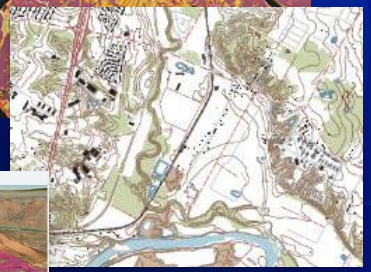


Roads and Highways

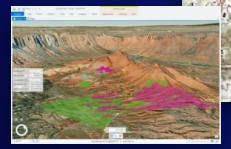
Natural Systems



Environment



Topographic



Cities & Conurbations

Analyzing

Informing

Planning

GIS provides a framework for . . .
. . . Creating & Integrating Digital Twins

Integrated Digital Twins

Interconnecting Content, Behavior & Workflows

Smart Cities

Urban Planning

Natural Resources

Emissions and Waste

Construction

Asset Management

Infrastructure

Design & Engineering

Buildings & Structures

Natural Systems

Workflows

Information Models

Cities

Networks

Data Models

Decision Confidence

Process Optimization

Communication

Risk Management

Efficiency

Collaboration

Transparency

Sustainability

. . . Enabling dynamic outcomes and analysis through location

ArcGIS Integrations

In Desktop Applications for Design, Construction, and Planning

ArcGIS for AutoCAD

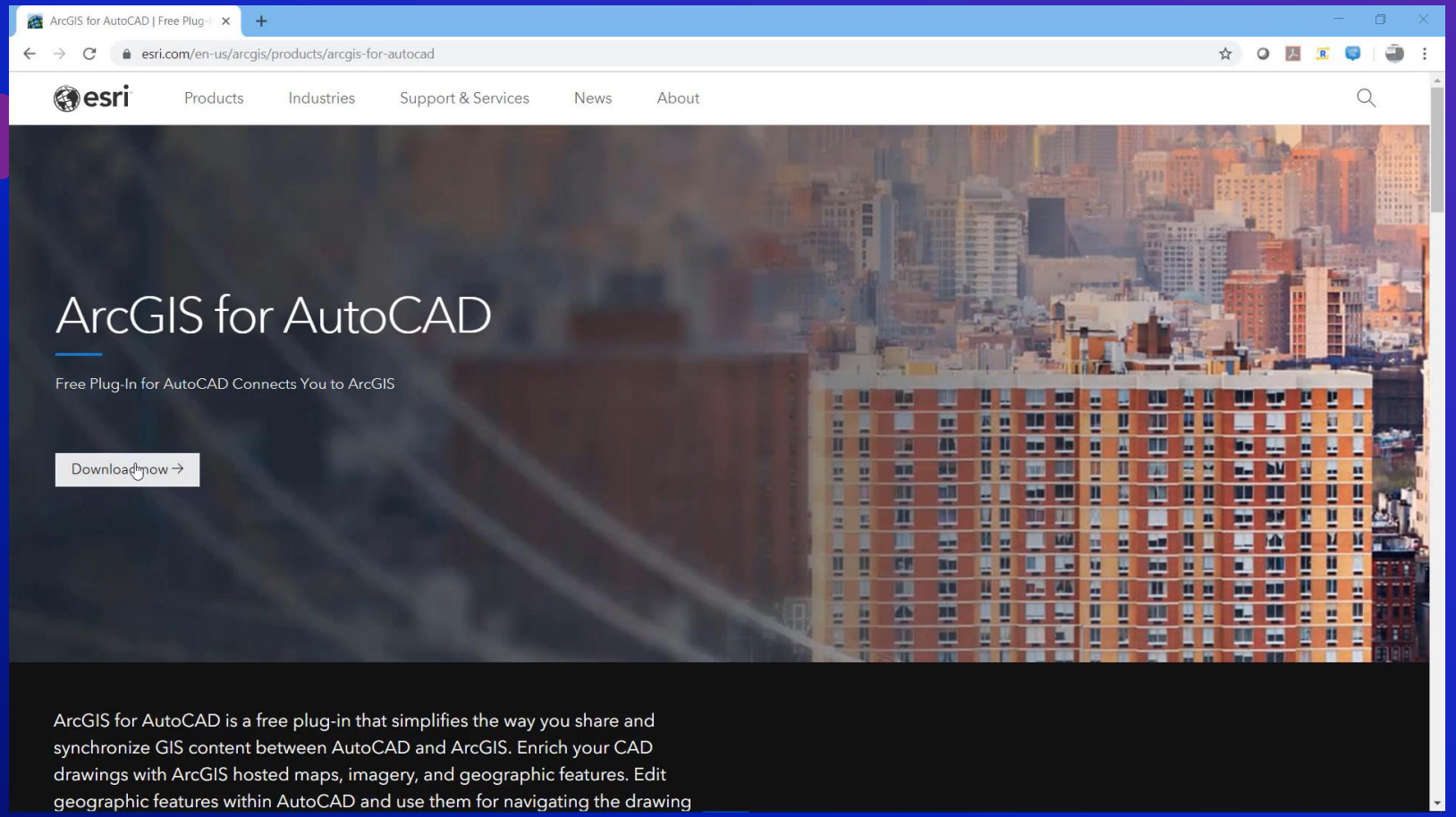
Bringing the power of mapping into your AutoCAD designs

Version 400

- View Map and Imagery
- Location Services
- Create & Edit GIS Feature Layers
- View GIS Attachments

This Summer…

- GIS/CAD Standards & Symbology
- Sharing CAD to Portal/AGOL
- Faster editing and QC
- Open Beta in early March
  https://earlyadopter.esri.com/



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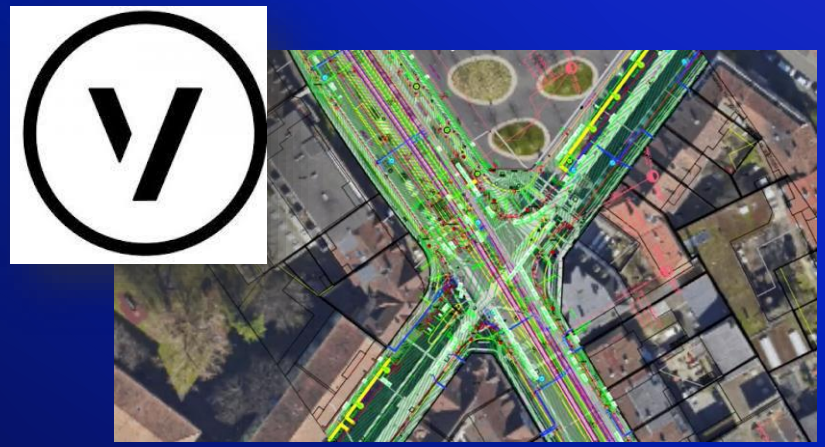
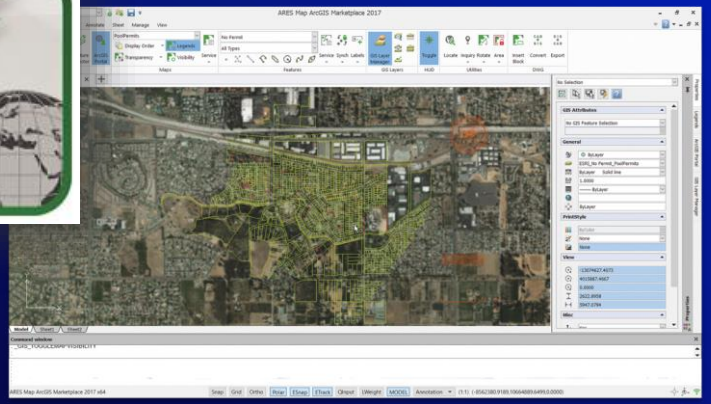
Design Application Connectors

ArcGIS Information in **design software**

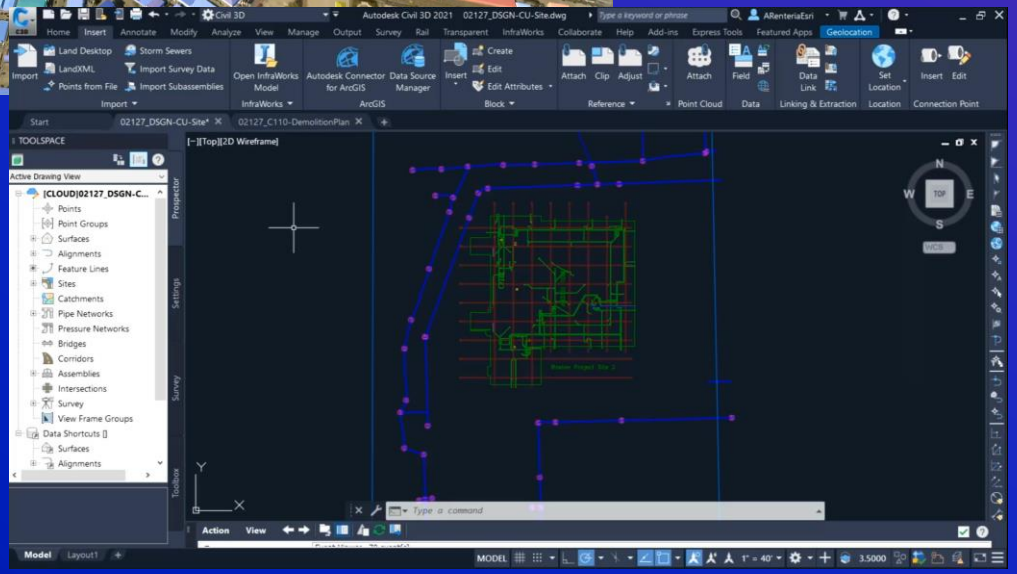


Nemetschek Vectorworks

Autodesk InfraWorks



Graebert ARES Map



Autodesk Civil 3D

State of Integrations Today

AUTODESK

esri

AUTODESK CIVIL3D

AUTODESK INFRAWORKS

Autodesk Connectors for ArcGIS

ArcGIS Online

ArcGIS Enterprise

AUTODESK REVIT

Enhanced in ArcGIS Pro 2.7

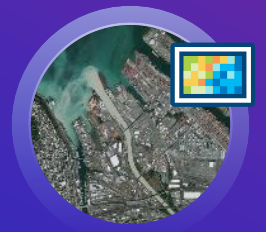
AUTODESK CIVIL3D

Enhanced in ArcGIS Pro 2.7

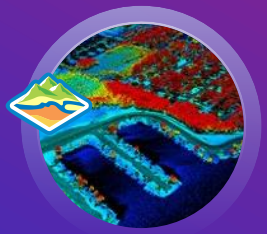
AUTODESK BIM 360

New in ArcGIS Pro 2.6

ArcGIS Pro



Imagery

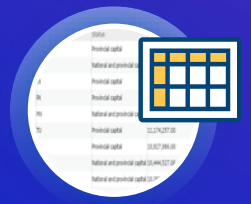


Lidar

CAD

3D

Vector



Tabular

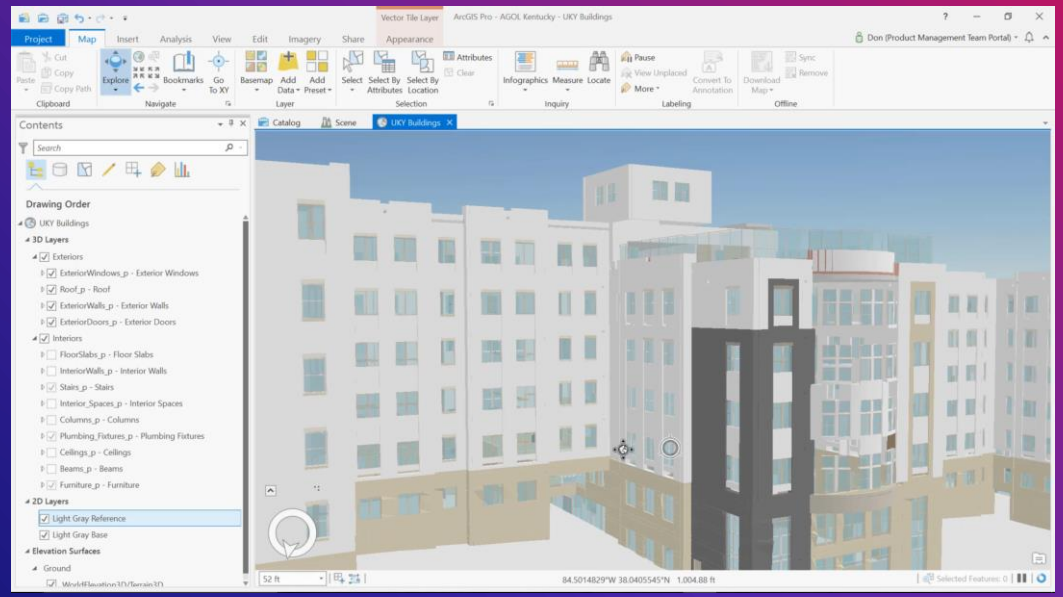
Real-Time (IoT)

Unstructured

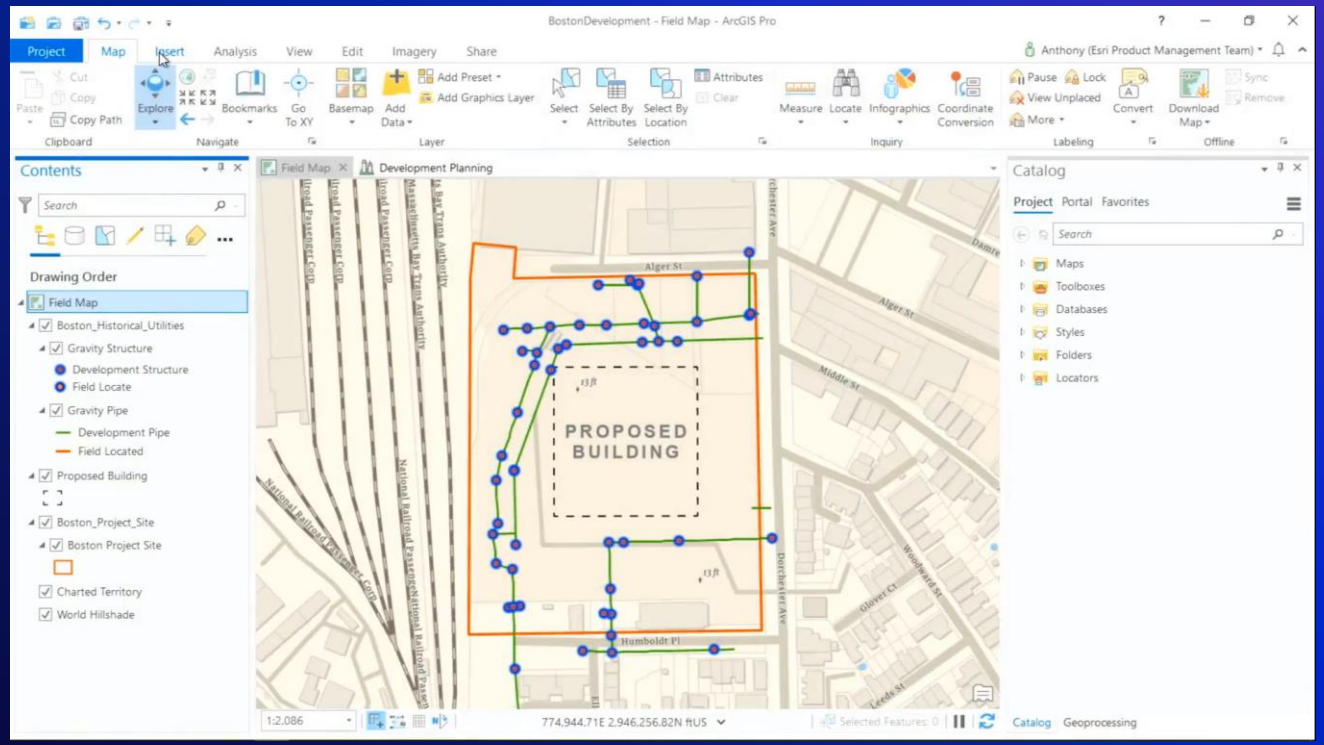
Additional data types TBD

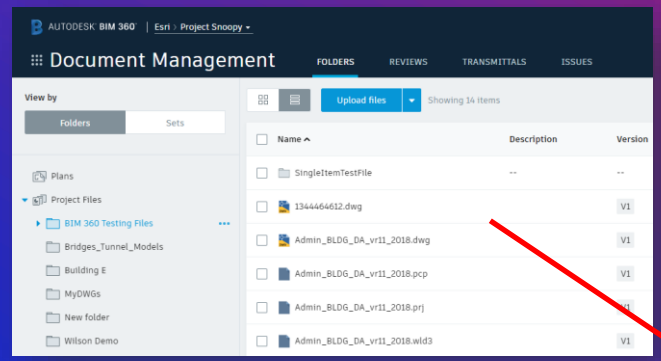
Directly Reading CAD & BIM…

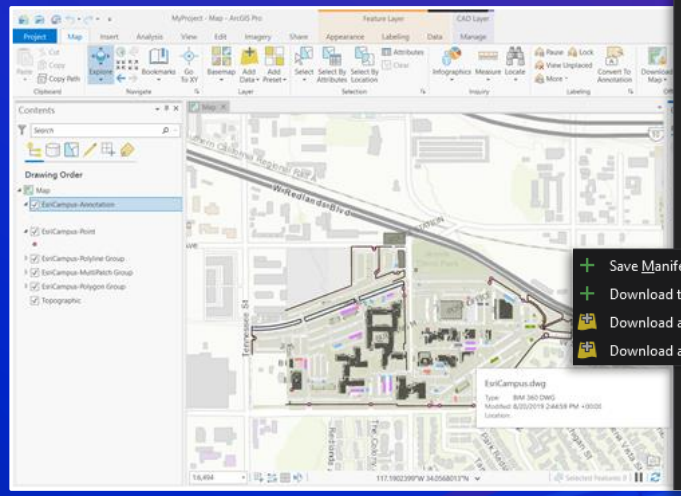
…in ArcGIS Pro

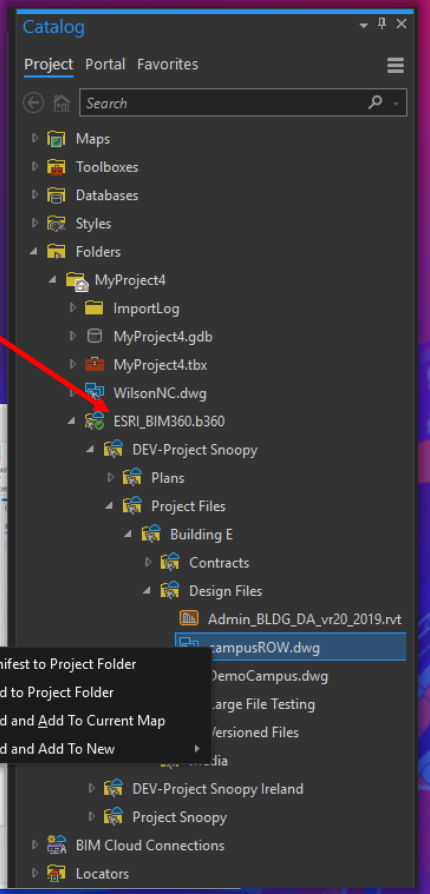


ArcGIS Pro Integration: BIM Cloud Connection

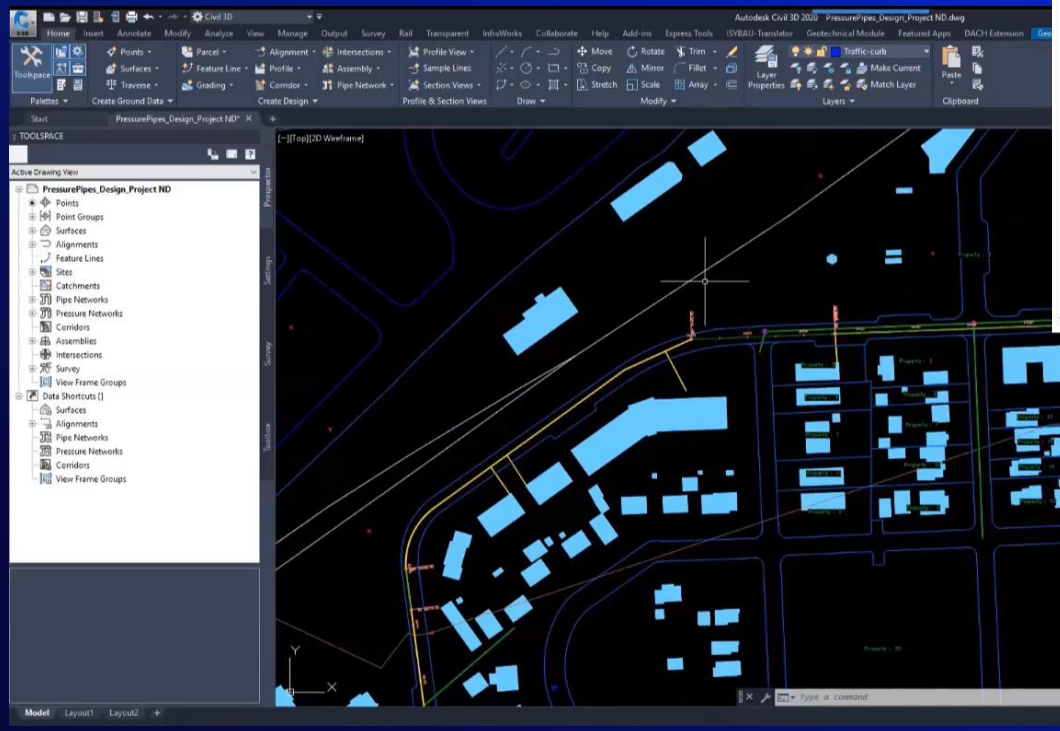


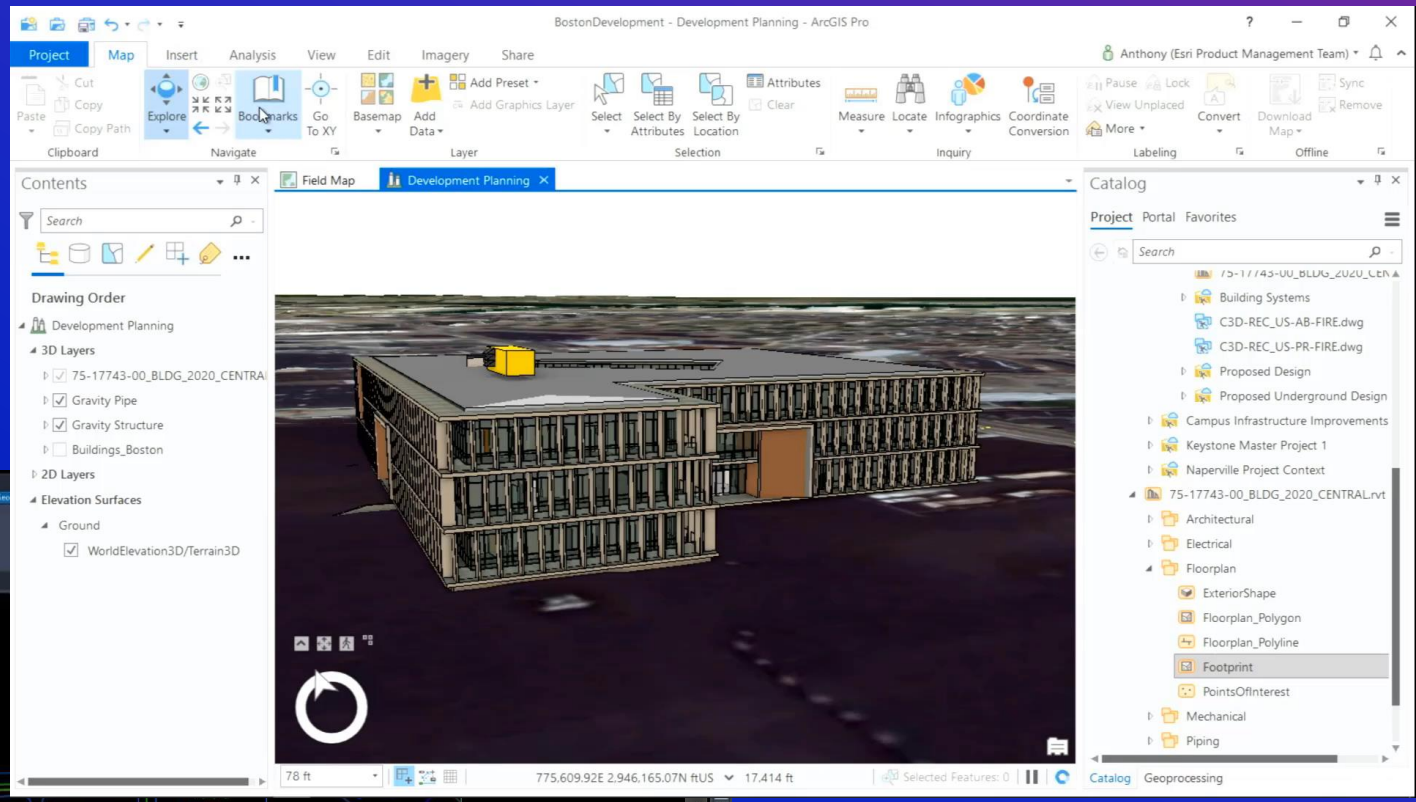




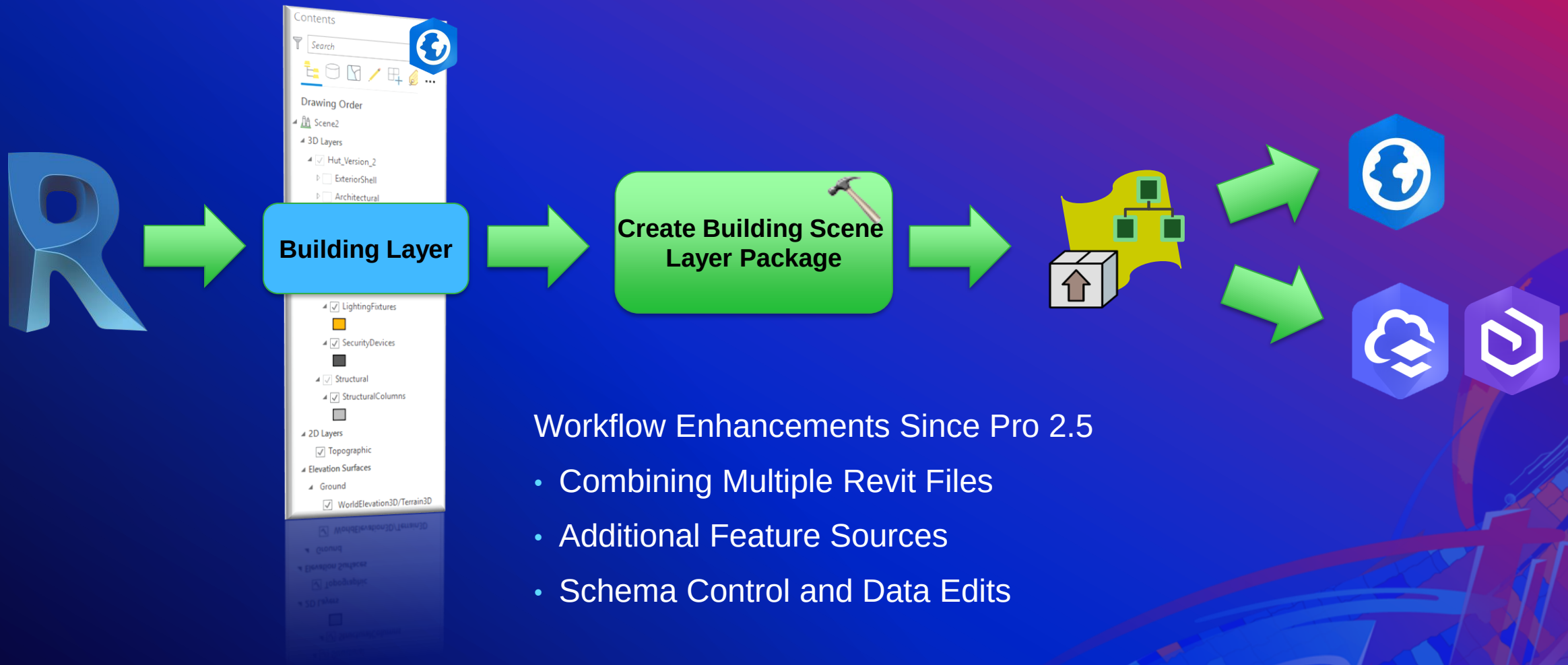


ArcGIS Pro Integration: Civil3D Support





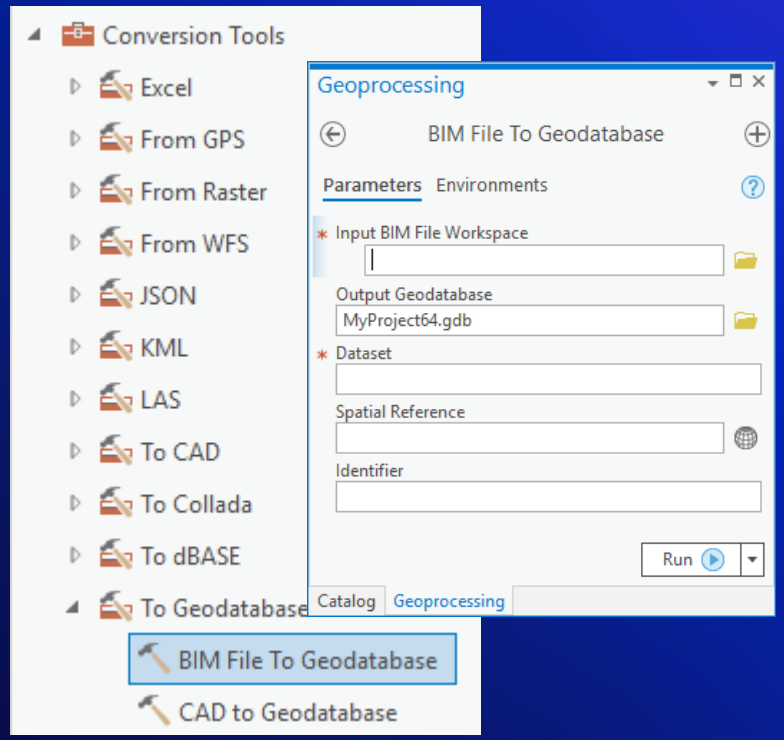
ArcGIS Pro Integration: Revit Support

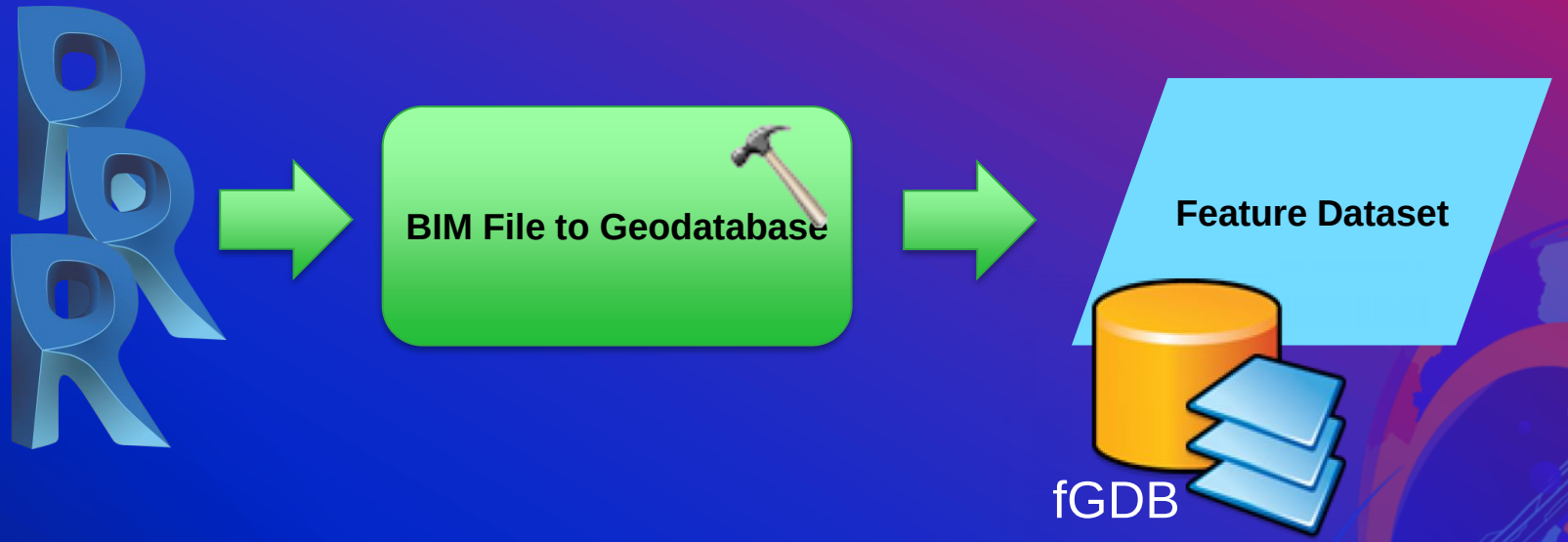


Workflow Enhancements Since Pro 2.5

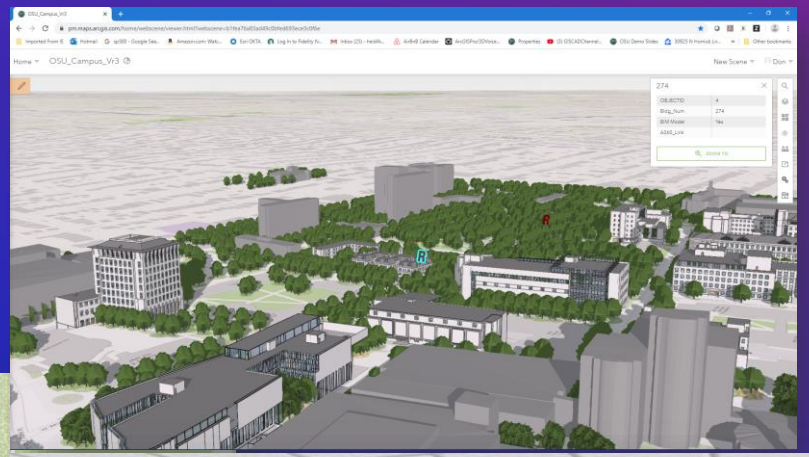
- Combining Multiple Revit Files
- Additional Feature Sources
- Schema Control and Data Edits

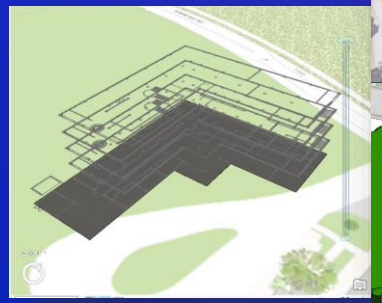
BIM File to Geodatabase





ArcGIS Pro: Revit Support Enhancements





ArcGIS Pro 2.5

Building Layers from Multiple Sources

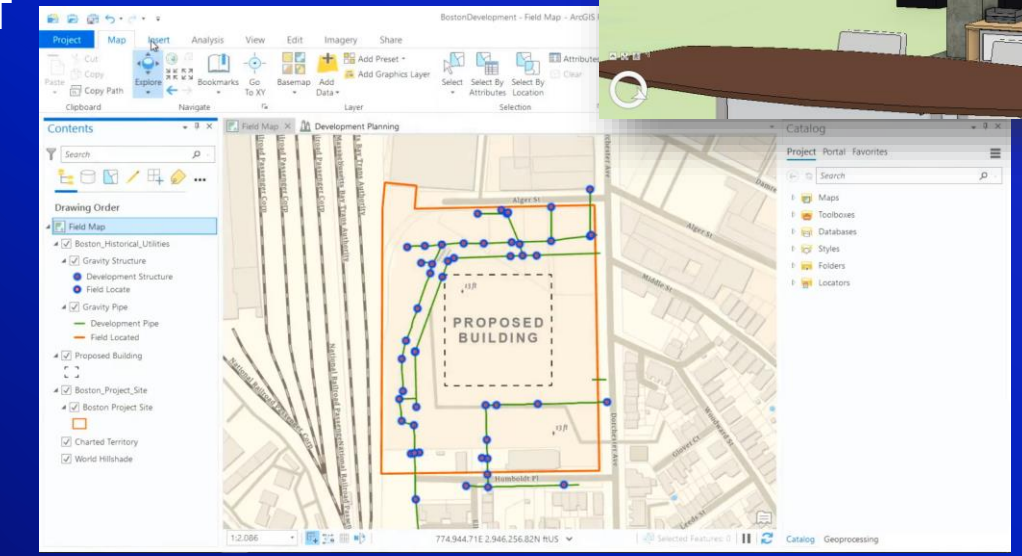
- Skyscrapers
- Campuses
- Data Simplifications, Data Enhancements
- Integrate Additional *Building* Sources (IFC,GDB…)

ArcGIS Pro 2.6

Building Layer Management

2.5D Objects as Assets/Features From RVT

- ArcGIS Indoors/IPS: Floorplans
- Site Mapping: Footprints, Building Object
- Asset Mapping: Points of Interest
- Colors/Textures



ArcGIS Pro 2.7

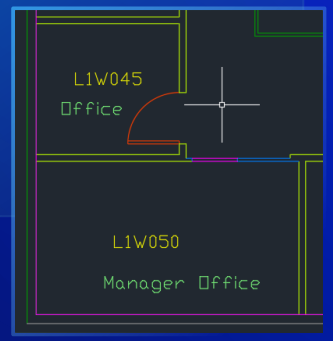
- Performance Enhancements
- RVT 2021 Support

CAD & BIM Conversion
for Indoor GIS

1.a

Evaluate CAD

- Doors, walls, rooms…
- Topology
- Annotation
- Consistency



OR

1.b

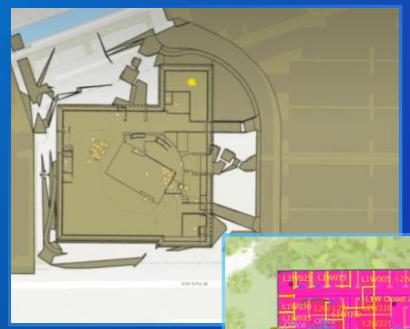
Evaluate Revit Floorplan

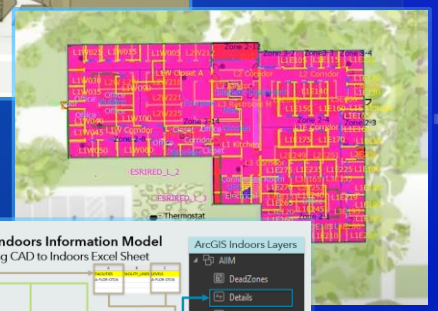
- Polygon
- Polyline
- Footprint
- Points (of Interest)

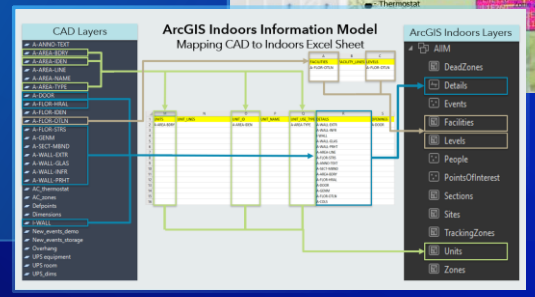
2

Prepare

- Re-project
- Georeference
- Layer mapping
- Create indoor GDB
- Create indoor Dataset *(Future Pro 2.8)*







3.a

Import Floorplans to Indoors

INPUT: Indoor GDB
INPUT: Layer mapping Excel file
INPUT: Unique ID Delimer
OUTPUT: Updated indoor GDB

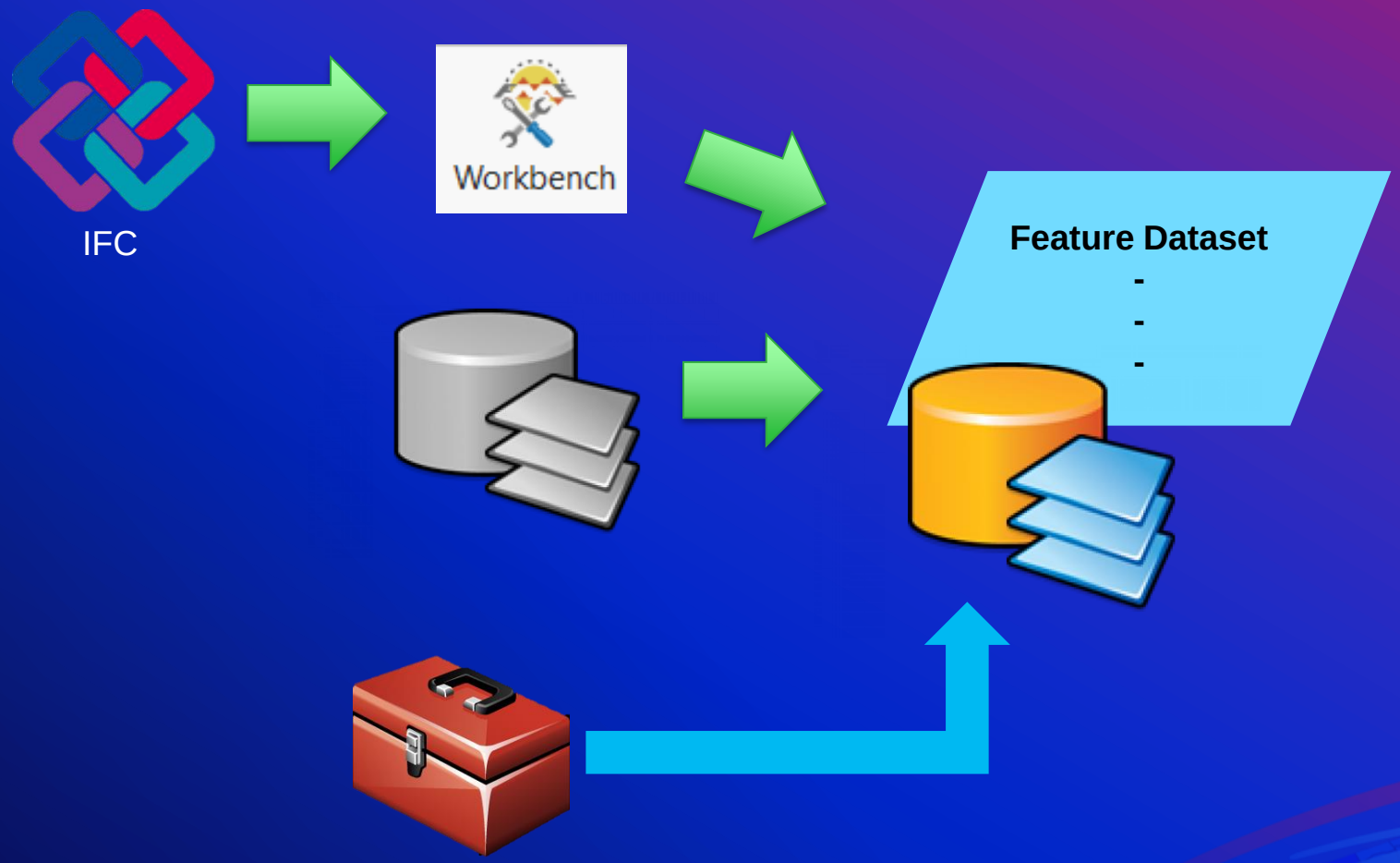
OR

3.b

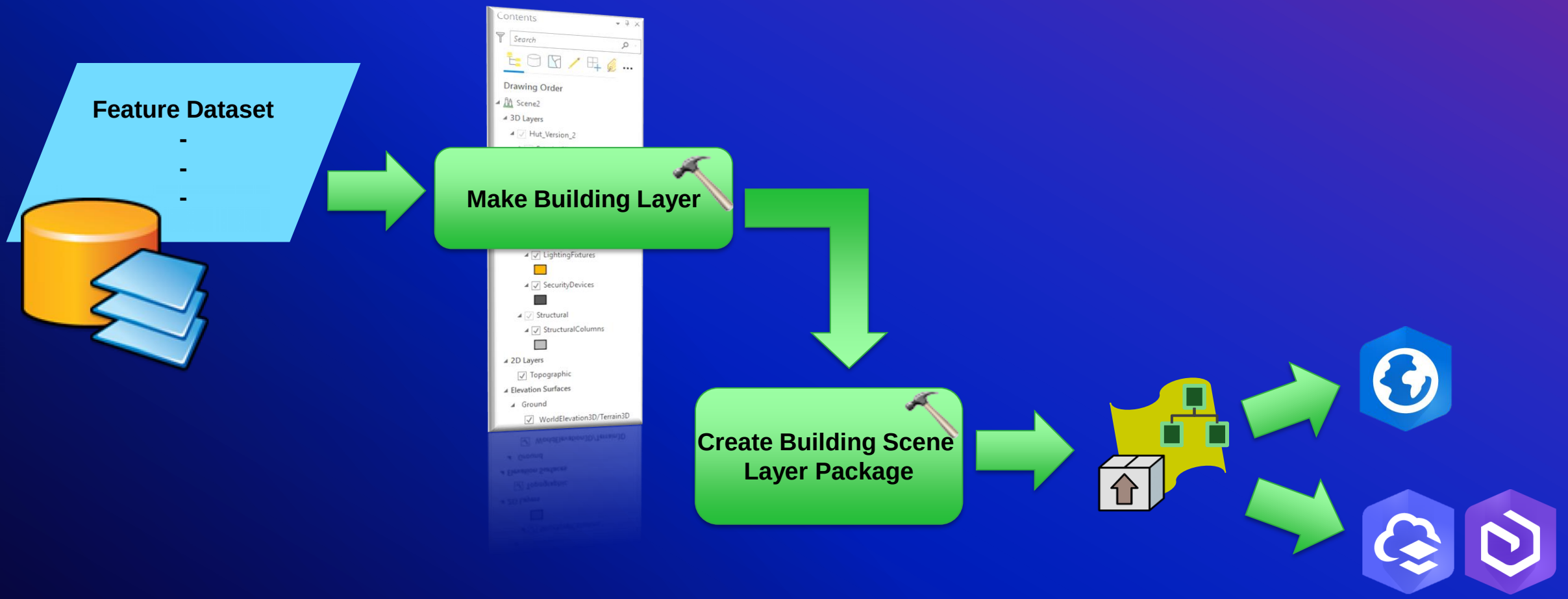
Import BIM (content) to Indoors

INPUT: Revit floorplan layer
INPUT: Indoor GDB or dataset
INPUT: Ground floor name
OUTPUT: Updated indoor GDB or dataset

Enhance Dataset

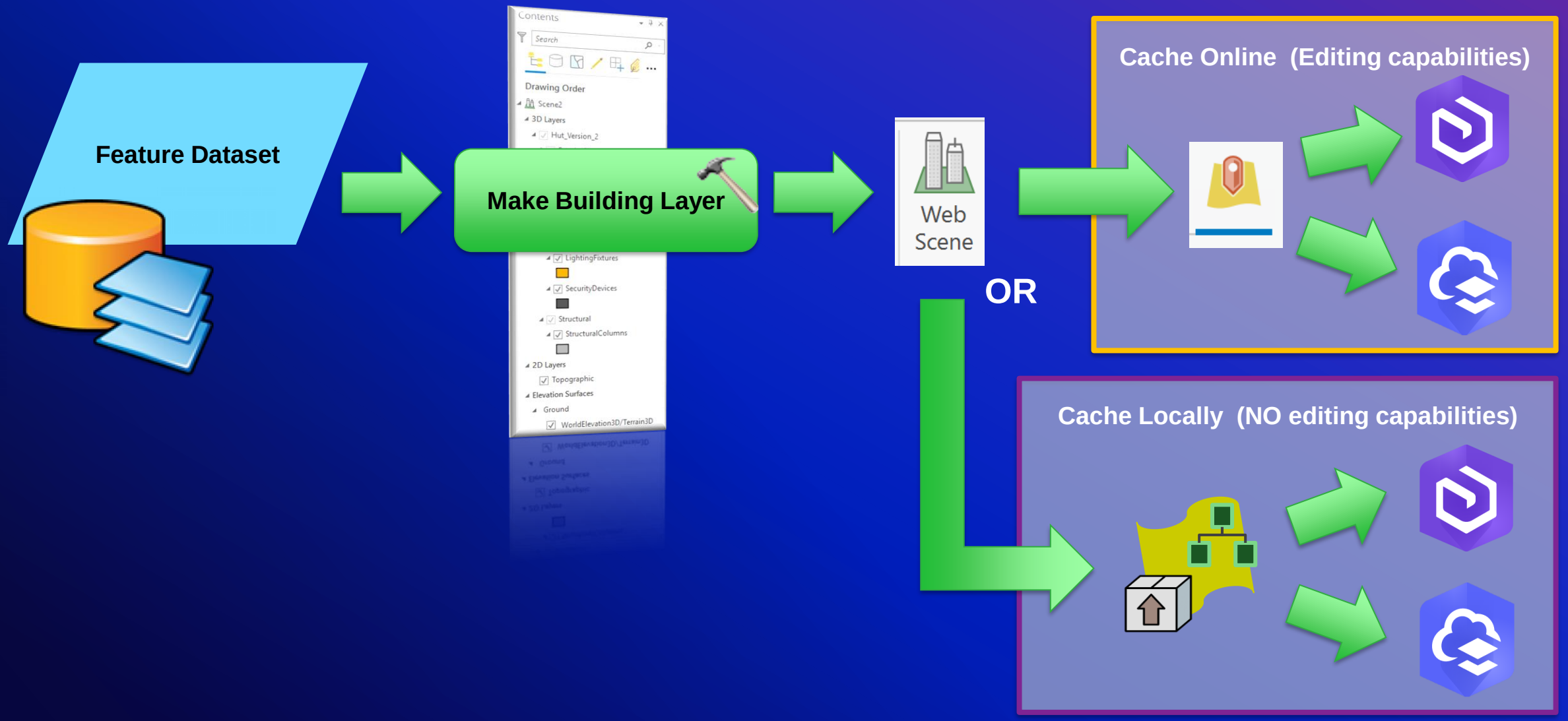


Make Building Layer & Scene Layer Pkg



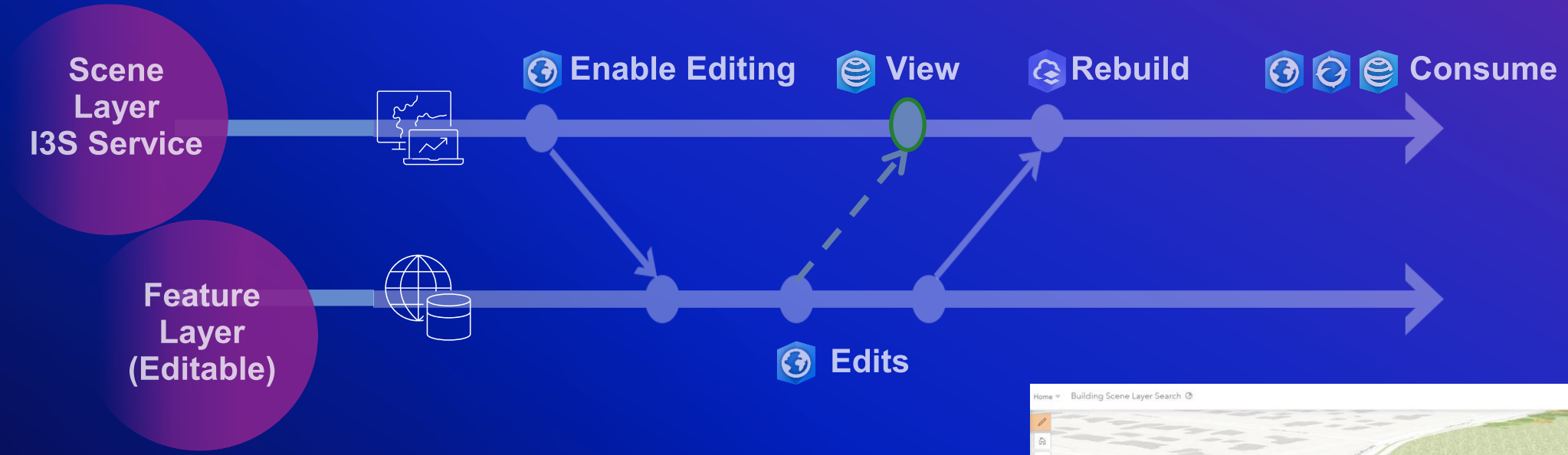
New

Share as Web Layer for Buildings



BSL Creation, Editing, and Data Management

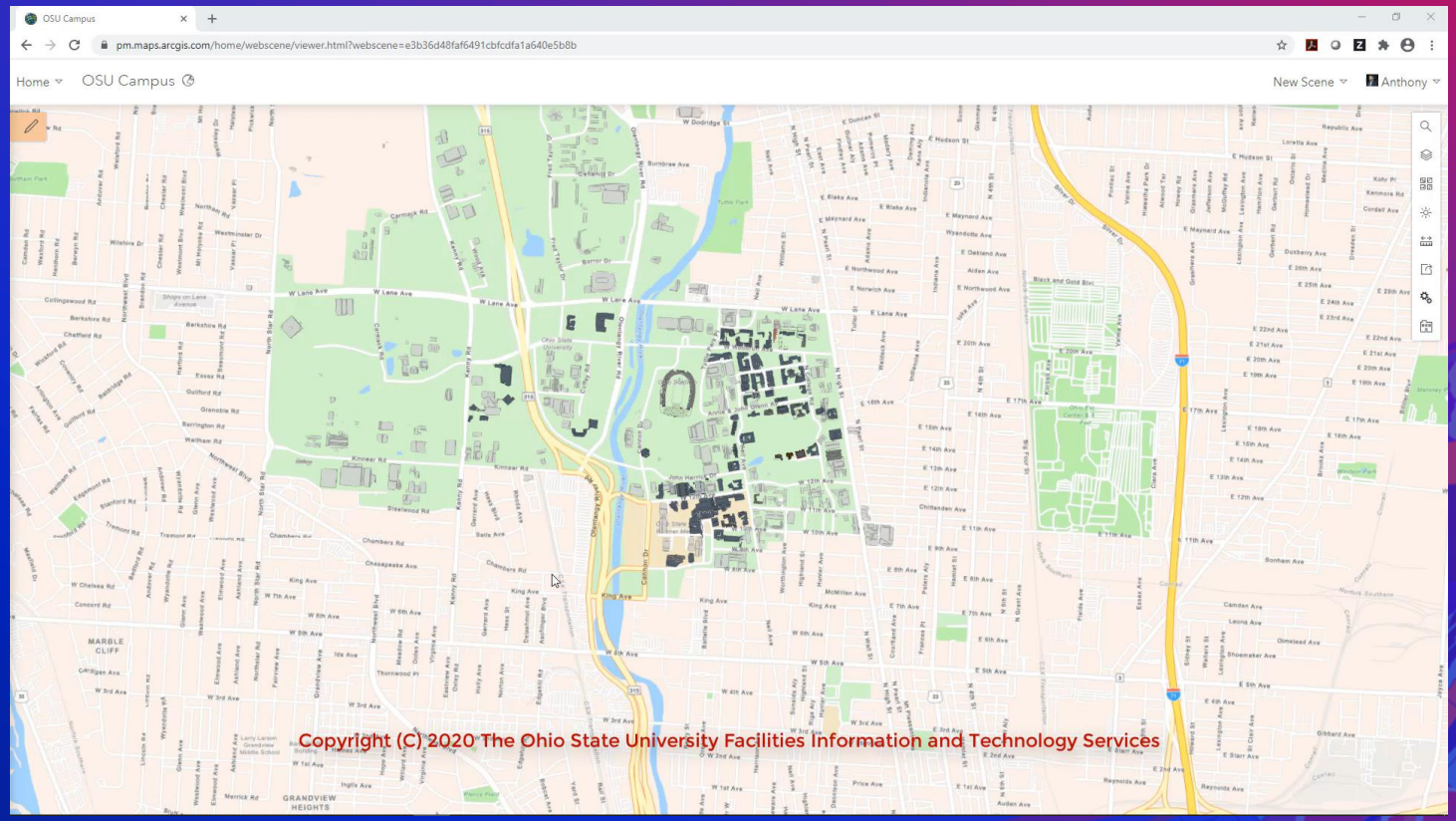
Maintain Scene Layer with Associated Feature Layer



- Building Scene Layer with associated feature layer
- Author editable scene layer
- Rebuild Scene Layer Online with Partial Updates
- NEW! Scene layer refers to associated feature layer for web-configurable popups, symbology, and BSL Search!

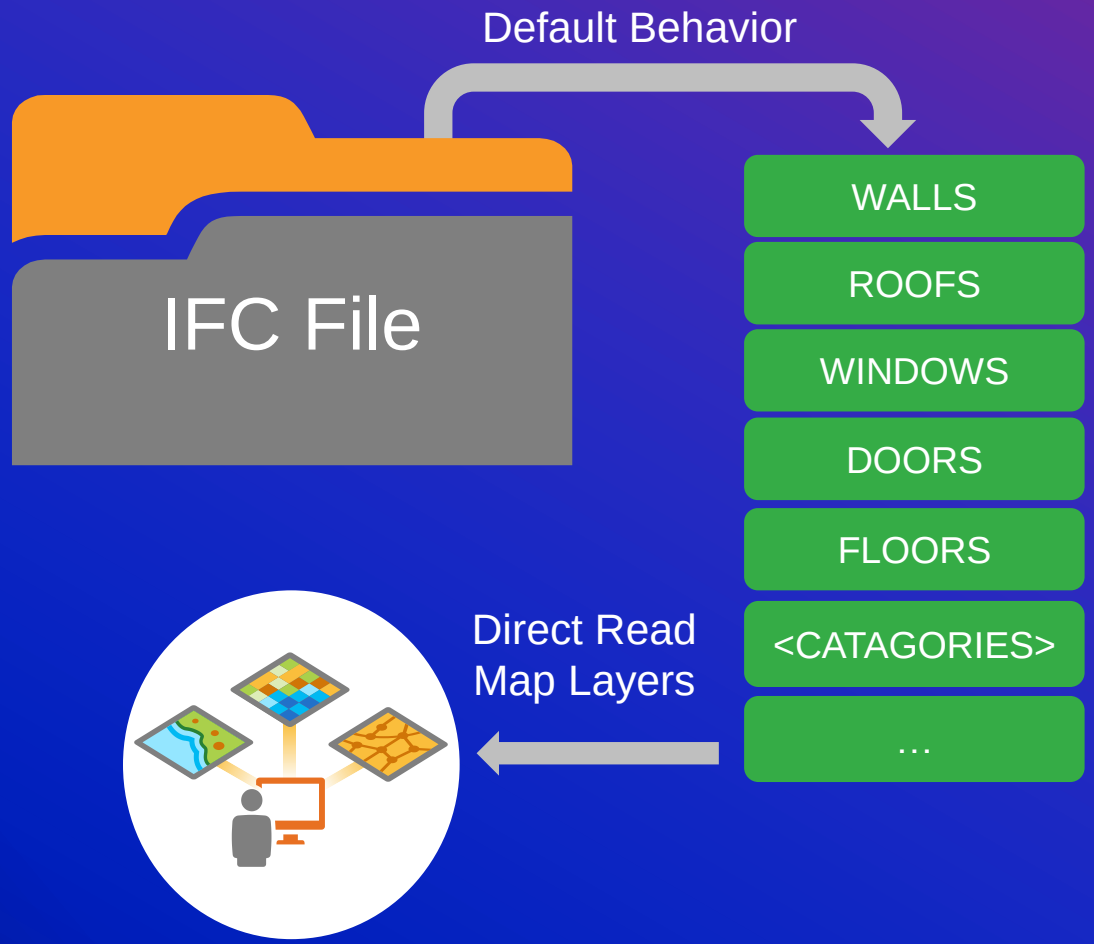
ArcGIS Pro & Web: Building Scene Layer

- Building Scene Layer effort
  - Captures semantics, geometry, and attributes from BIM models into streamable 3D GIS format
  - Focused on MEP+A+S content from Revit and IFC
  - Adding colors, textures



Next ArcGIS Pro Integration?

- Direct Read in Pro
  - Work to support IFC direct read as GIS features on import
  - Use in combination with Make Building Layer
  - This is only specific to Building IFC
    - Hold on other IFC types depending on future approved specs (Bridge IFC)



…Adding IFC Data in ArcGIS Pro

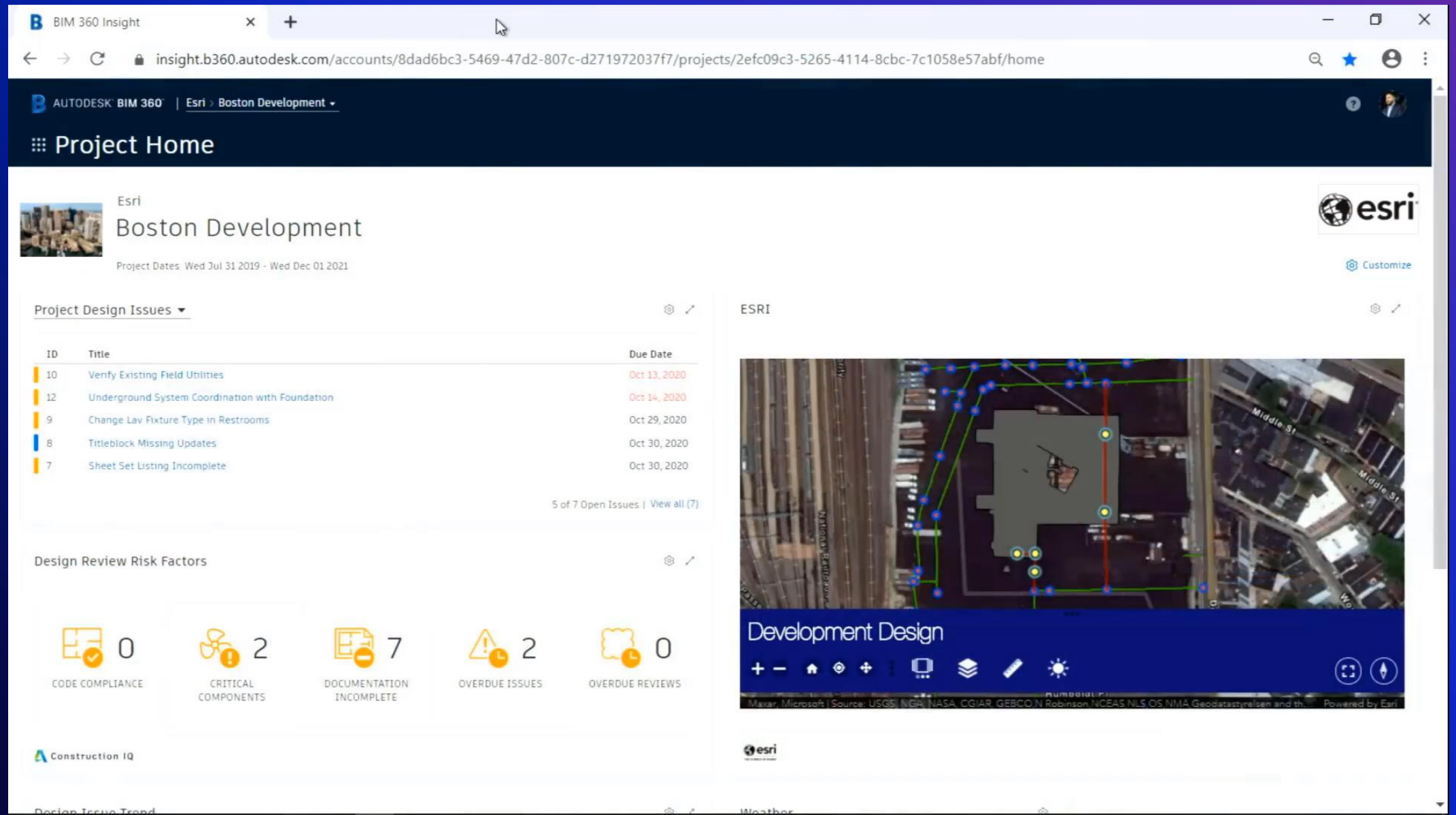
Esri Confidential

ArcGIS Driving Engagement

Through Web Services, Scenes, and More

The Ohio State University – 90+ Revit models in a single i3s Layer

Esri Partner Card in Autodesk BIM360



New

Coming in 2021

ArcGIS GeoBIM℠ Interconnects ArcGIS with Autodesk Construction Cloud

Cloud-to-Cloud Connectivity

Dynamically Integrating GIS & BIM Data…
. . . Helping to Achieve Digital Twin Integration

GeoBIM Projects

Apps

AUTODESK CONSTRUCTION CLOUD™

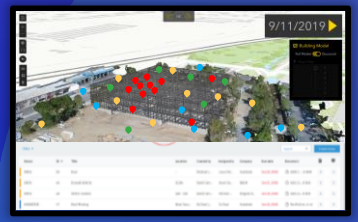
InfraWorks, Civil3D & Revit

ArcGIS Online & Enterprise

ArcGIS Pro

GeoBIM Apps

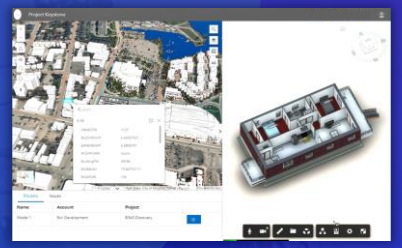
Issue Clustering



Documentation Review

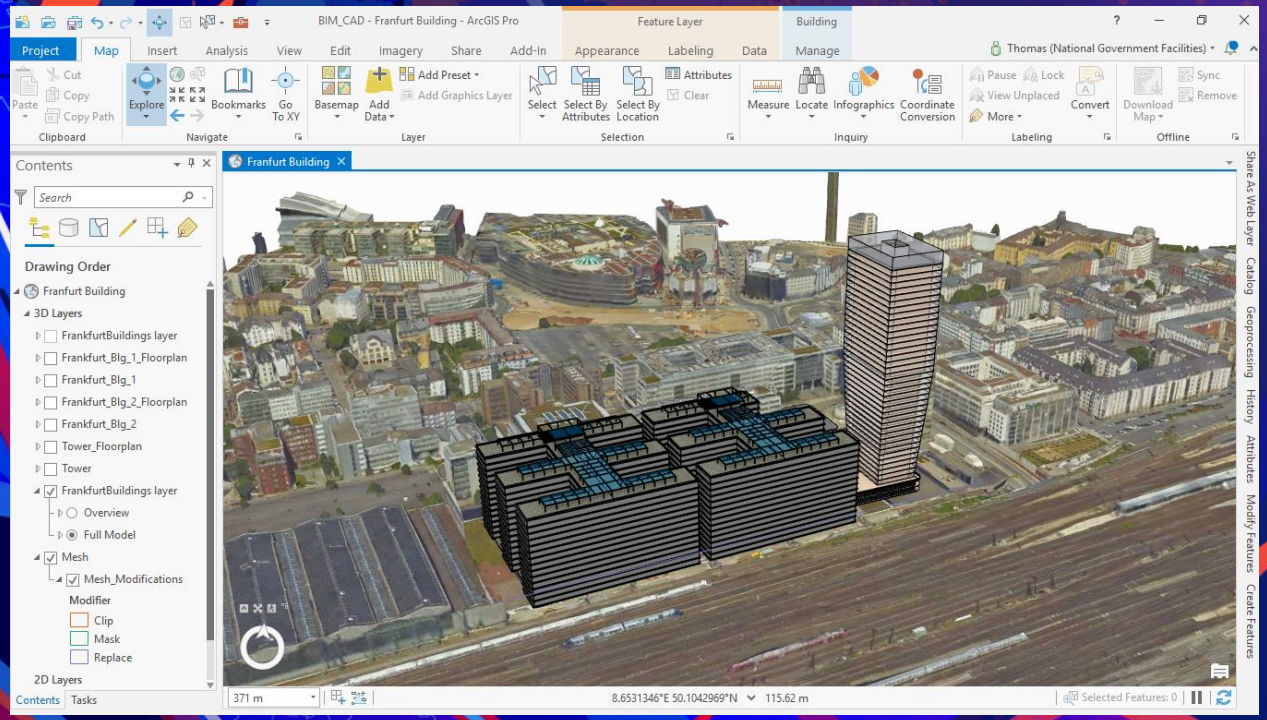
Performance Dashboards

Design Coordination



Plan | Design | Build | Operate

Supporting Design, Construction and Operations . . .
. . . Transforming Projects with Geographic Context



Demo

Combining BIM, CAD, GIS and Sharing to Online Services

Key Takeaways

Progressing Collaboration from Desktop to Cloud

Value of GIS, CAD, BIM Integrations

- Building integrations focused on your workflows
  - Do more with your data whether you're using BIM or GIS content!
    - Solve problems & make evidence-based decisions faster
  - Break down internal/external silos
  - Digitally optimize existing workflows
  - Move data to the center of processes
  - Expose new opportunities to drive your business or organization

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