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Giant Steps: Advances in Seamless BIM, CAD, and GIS Integration

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Learning Objectives

- Learn about the power of the Autodesk and Esri partnership to streamline your project and support your digital twin.
- Learn about the enhanced capabilities of maximizing, publishing, and maintaining GIS content from the Autodesk desktop.
- Learn how to reveal additional value from your BIM and CAD data and set the stage for ArcGIS GeoBIM applications.
- Learn about how ArcGIS GeoBIM can help you to better manage your project.

Description

Learn from the product managers how the Autodesk and Esri partnership is advancing design and geographic information system (GIS) collaboration that benefits the architecture, engineering, construction, and operations industry. The intersection of building information modeling (BIM), CAD, and GIS provides incredible insights to enhance project delivery at every level. The functionality between Autodesk and Esri desktops, and collaborative web applications like ArcGIS GeoBIM, are improving workflows and transparency for project teams. The improvements in direct support for RVT, DWG™, and IFC in ArcGIS Pro, and support for hosted GIS feature service in Civil 3D software, InfraWorks software, AutoCAD Map 3D software, and AutoCAD software help bring together design and GIS data. The direct cloud connection between Autodesk Construction Cloud and ArcGIS Online/Enterprise offers exponential benefits to help manage the project content for stakeholders. The ability to publish Autodesk data directly to ArcGIS Online/Enterprise for use in shared web and field applications expands the value of the data far beyond the design professionals.

Speaker(s)



Anthony Renteria is Esri's Sr. Product Manager for ArcGIS GeoBIM focused on the project and asset life cycle where BIM & GIS integration is incredibly valuable. He is currently working with customers interested in integrations that enhance their workflows, provide better engagement opportunities, and transform how projects are delivered to clients for operations. Anthony has worked in industry for over 15 years assisting AEC teams with project technology planning while incorporating innovative solutions to complete tasks faster and with the utmost quality. While Anthony began in general contracting, he has worked extensively with designers, engineers, and facility teams to improve standards and develop BIM guidance that encompass the full project life cycle. Anthony is CM-BIM certified (AGC of America) and holds a BS in Mechanical Engineering from the University of Southern California.



Ramesh Sridharan has over two decades of experience in civil infrastructure, including civil engineering, reality capture point clouds, GIS, image processing, and machine learning-based software development. With over 20 years of experience, he has successfully driven programs in research and development, technical sales, partner marketing, product management, and customer analysis. He has experience working with customers to understand and set industry workflows that drive the technology forward. He is a pioneer in reality capture point clouds that can handle and extract information from many 3D datasets. Ramesh is currently one of the product managers for infrastructure products in Autodesk, spearheading Reality solutions, InfraWorks, and Geotechnical Modeler, to name a few. Ramesh is a post-graduate of the Indian Institute of Technology with a research focus in Image Processing and Artificial Intelligence.

BIM & GIS Background

For many years, infrastructure and building professionals have been siloed across departments, ways of working, and technology. While useful related asset information was developed in both BIM and GIS workflows, these often had limited pathways into each other that took timely effort and even lost robust information in limited exchanges. Users continued to encounter communication barriers across processes that also impacted stakeholders, but these communities could see a possibility where bringing these two worlds together could empower new insights needed to modernized projects and asset operations.

Autodesk University 2017

Heading back in time to AU 2017, a significant shift in interoperability occurred. Autodesk and Esri announced the start of a new partnership to build bridges between BIM and GIS processes and support joint customers to create positive impacts across the globe. Together, that vision focused on enabling industry to gain better context by visualizing and forming analyses from data fusions between the environment, man-made structures, citizens, and networks connecting it all.



This allowed both companies to work together with customers and develop better integrations with their respective technologies that focus on the sustainability of processes and enable resilient outcomes for communities needing housing, safe water, utility services, and transportation.

Breaking Down Data Silos with Improved Interoperability

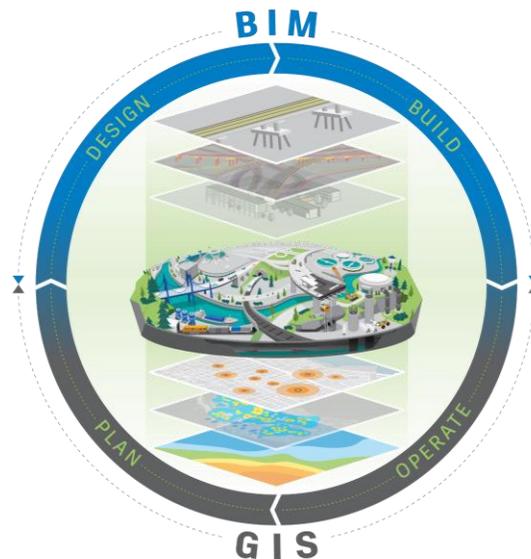
Over the course of these past five years, both AEC firms and agencies began to experience new efficiencies including

- Saving up to 28% on project design times
- Shortening average construction schedules up to 90 days
- Reducing average project costs up to 13%

Numerous customers were interviewed and surveyed where they shared their time savings, found increases in faster plans to permit approvals, improved coordination and collaboration, reduced cycle times and multi-party workflows, and reduced material and resource usage. This and more case studies from customers can be found through this site providing stories and access to the [report](#).



While many customers are using these new capabilities that are driving opportunities within their organizations, some are still wondering how and where to begin. This session covers an overview of current integrations, provides a framework to consider within your own journey into BIM & GIS integrations, and provides resources in case you would like to learn more about each. Depending on what tools you are using today, there may be new concepts to learn in this convergence of BIM & GIS, but you do not need to figure it out alone. Based on our users' steps, we have seen a repeatable pattern that transforms these worlds into proven systems that enable asset intelligence.



This starts with building your **Systems of Insight** with desktop tools both in Autodesk and ArcGIS that are fueled by GIS and BIM. Whether you're using Autodesk InfraWorks, Civil 3D, or ArcGIS Pro, you have ways to incorporate information that helps set context with asset details providing new insights and analysis within your professional work. These datasets can then be collaboratively saved within your **Systems of Records** within the Autodesk Construction Cloud and ArcGIS Online & Enterprise to extend information securely across systems to users that can quickly reference and incorporate new dynamic information in their applications. Finally, as these records continue to progress and evolve, you can create a **System of Engagement** in ArcGIS GeoBIM. Simply connect progress views of both BIM & GIS clouds together that share a single web interface for stakeholders to understand complicated changes, provides feedback and transparency into the process without opening a desktop application. Let's get started!

Elevating Design and Construction with Geospatial through Autodesk Integrations

Collaboration between design and GIS is not an easy task. The collaboration can mean different things to different personas, and the details vary based on use cases and workflows. To cater to various Design and GIS workflows, Autodesk went through many customer interviews to understand the pain points and identify high value for the users like you. To ease the complications and increase the efficiency of the impact on customers, Autodesk started with Desktop Collaboration first before moving on to Cloud collaboration. In a nutshell, this desktop collaboration can access GIS data from Autodesk products (InfraWorks, Civil 3D, Map3D) and use them in preliminary design/ conceptual design, detailed design, or many more. This workflow does not involve just visual, just views, but actual data with geometry and the attributes.

Autodesk Connector for ArcGIS creates an informed design, engineering, and planning. The flow of GIS data in conceptual, preliminary, and detailed design is a vital need almost all infrastructure projects go through. However, data flow has always been elusive and had to go through import/export, not to mention different formats and sizes involved in this workflow. To ease that, ADSK and ESRI worked together to create this Connector that can facilitate the easy flow of data between the ESRI cloud and ADSK design products.

Autodesk took a systematic approach starting with one-way data import of geometry, followed by attributes support, and the ability to publish, refresh and save back, making it a proper 360 workflow for the customers. From Autodesk Civil 3D perspective, the purpose is to bring the data as Civil 3D objects. Older workflows like Shapefiles, Geodatabases, FDO connections, etc., are still available for Civil 3D users. But this Connector for ArcGIS makes the whole workflow much smoother, focusing on the type and location data that users need and taking the complexities like file formats, import/export, file sizes, folder searches, etc. out. We then integrated this workflow with three main infrastructure products. InfraWorks, Civil3D, and Map3D.

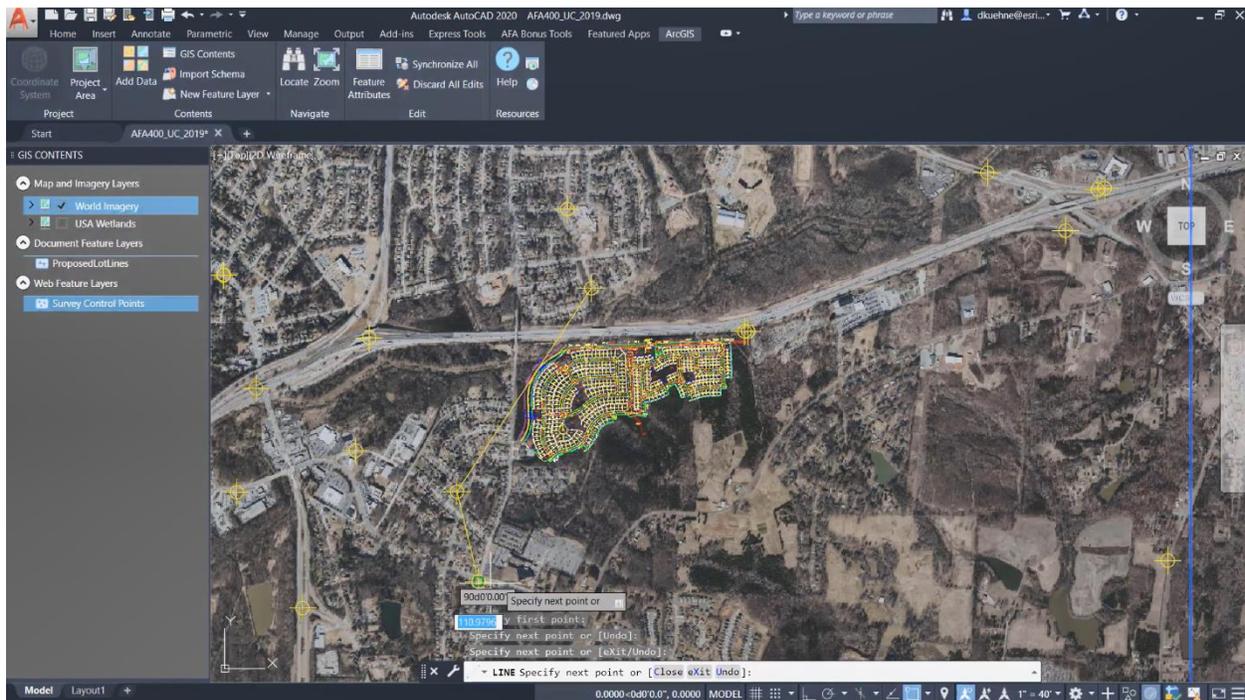
With Autodesk Connector for ArcGIS, we enabled a new way of working that allows cross-functional teams to manage information flow and integrate Design and GIS systems. We hope the result is better collaboration throughout the project lifecycle.

This presentation shows you a glimpse of this workflow. For more details, please check [Autodesk Infrastructure YouTube Channel](#) also this recent [webinar](#).



Building Location Intelligence through ArcGIS Integrations

Within the ArcGIS realm of integrations, we started in the past by supporting users with coordination problems that often occurred between users needing to edit related datasets both in GIS and AutoCAD. With **ArcGIS for AutoCAD**, Esri continues to simplify the creation, sharing, and synchronization of GIS content between AutoCAD and ArcGIS. If there are CAD users with challenges making edits and updates to GIS, this may be an option to include that CAD user with your Geospatial users. For more information on capabilities and how to get started with this free plug-in, [head here to learn more](#).



For Geospatial Professionals, there have been several exciting developments within **ArcGIS Pro** that incorporates new ways to incorporate BIM content and publish your information into fast, streamable layers for web applications.

Start with the BIM Cloud Connection!

Users within ArcGIS Pro can load models from their local drives, but the BIM Cloud Connection feature provides a quick way to access RVT, DWG, DXF, DGN, and IFC files and their respective projection and world files as they're published or changed within the Autodesk Construction Cloud (ACC). During the import process, ArcGIS Pro will build an attribute with the file's original ACC storage location and provides future statusing for a user to check updates. (This ability to create GIS layers storing the URL from their BIM sources becomes handy in later steps when linking across systems.)

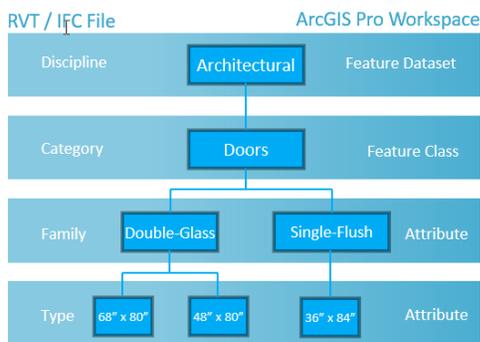
Georeferencing BIM Datasets

After finding datasources, the next step to focus is on understanding how to locate them in the world. There are a number of ways digital models can be set up, or not set up, with coordinate systems. So how will you know if these files will show up anywhere near

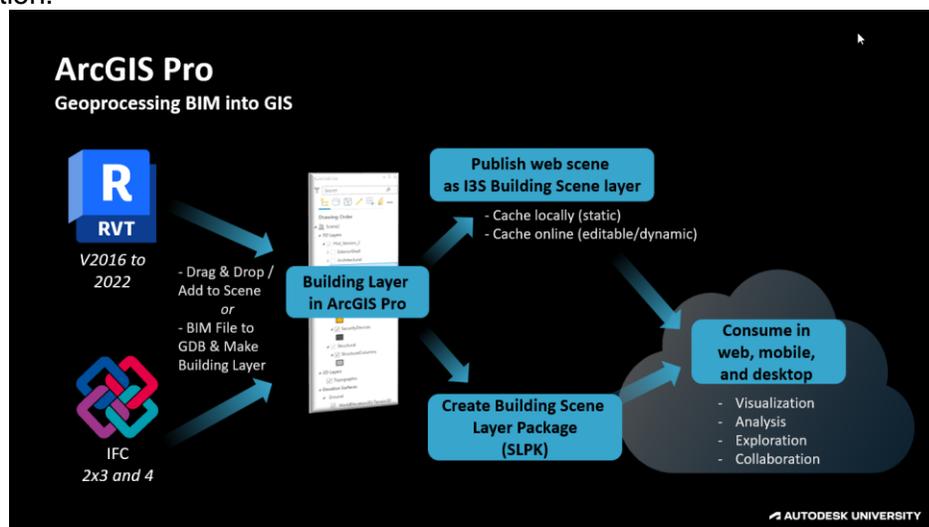
their actual world locations? When adding your models into the Pro catalog, start by right clicking the file and inspecting if the digital model has spatial references, world file transformations, or model transformations. Depending on if these categories of information, you can validate the positions and assign a coordinate system or suggest a nearby address location to help you position the data. For more information on the different considerations when georeferencing, check out this [georeferencing blog post](#) providing additional tips.

Direct Read of RVT & IFC Files and Geoprocessing

When incorporating these digital models as GIS layers for your maps and scenes, you will need to make a conversion either 2D or 3D features. Pro reads the full RVT database as it adds these into your GIS, and it creates these with the rich attribution coming from Revit.



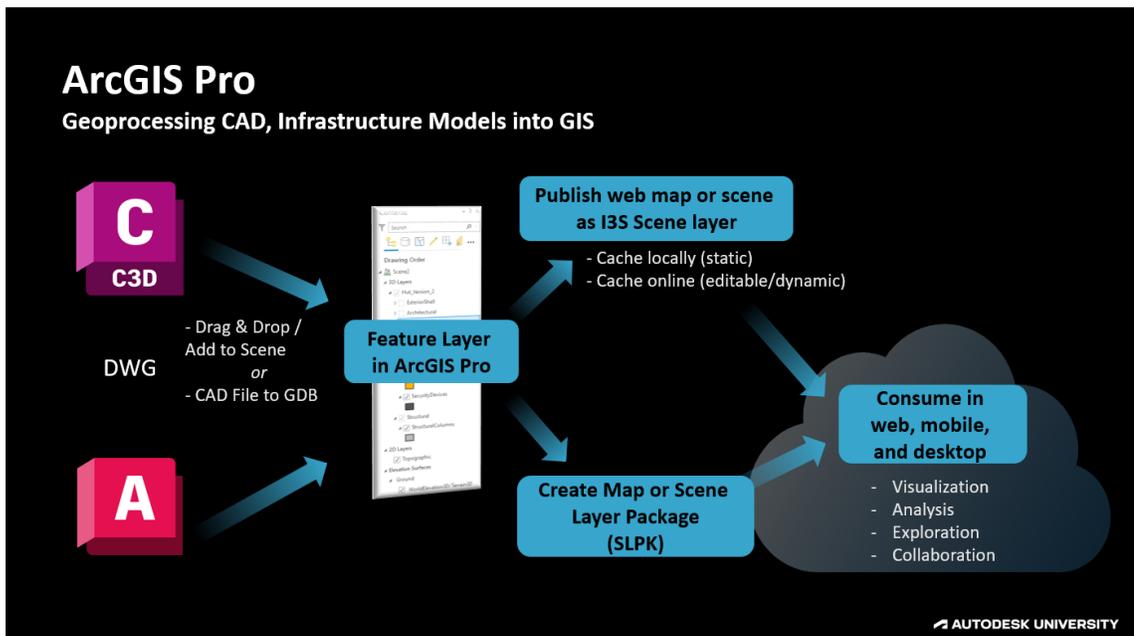
There are geoprocessing tools within Pro that can help you combine multiple files together into single layers, and you have options depending on how you need to prepare or edit these datasets before they are published into your cloud source. [This blog](#) provides a great way to understand these options depending on the organization of the information.



Direct Read of Civil 3D DWG and Geoprocessing

When creating your GIS geometries from Civil 3D object entities, there are different options for the creation of 2D or 3D features with attribution that correspond to related uses. For a table outlining what types of GIS features can be created from Civil 3D Objects and which GP tools to use, see below.

Autodesk Civil 3D Object	Esri Geometry Type
Alignment	Polyline M
Appurtenance	Point
Site	Polygon
Catchment	Polygon
Feature Line	Polyline
Fitting	Point
Parcel	Polygon, Polyline
Pressure Pipe	Polyline, Multipatch
Gravity Pipe	Polyline, Multipatch
COGO Point	Point
Structure Point	Point
Surface Point, Break line, Surface	Point, Polyline, Multipatch
Solids	Multipatch



What's new in ArcGIS Pro?

New support for infrastructure modeling types coming from the bridge design workflow within InfraWorks, Inventor, Civil 3D, and Revit. Also included new support for IFC 4.3 schemas for rail, airports, bridges, tunnels, and roadways. To learn more about these steps on creating layers and publishing datasets online, check out this [Learn Lesson](#) to walk through the process on sharing to 3D web scenes.

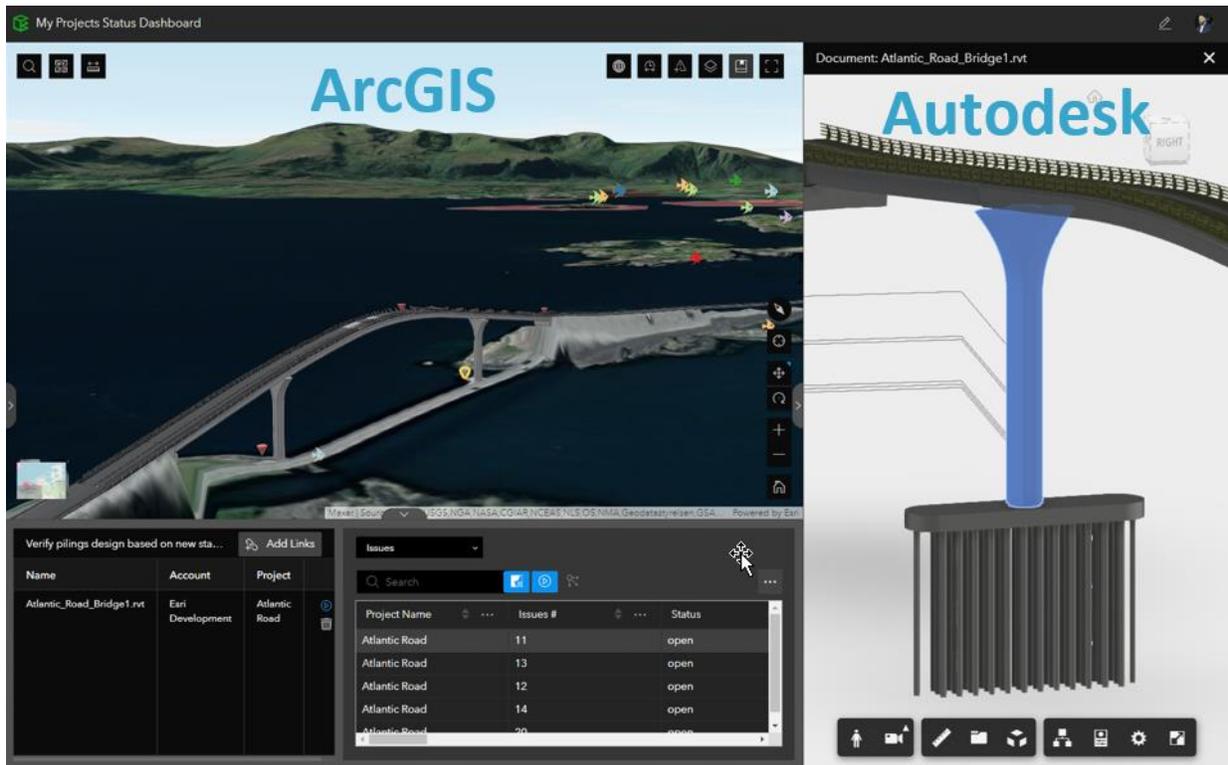


Once you have layers shared to your ArcGIS Online or Enterprise account, you can build beautiful scenes incorporating various datasets that help communicate a full holistic view of your project space. Within **Scene Viewer**, you can combine multiple layers, 2D or 3D, point clouds, meshes, and building scene layers that help you visualize and assess large amounts of information from a web browser. If you don't have your own layers to help set context for nearby buildings and trees, there are new OpenStreetMap 3D Buildings and Trees layers that can be used in relation to your project information.



Now that you have historical records for your BIM process stored in the Autodesk Construction Cloud and asset information with environmental layers stored with **ArcGIS Online or Enterprise**, you can next create connected workflow views within **ArcGIS GeoBIM**, that anyone with a web browser can access. This helps build transparency into your project processes that helps inform more stakeholders on the progress of your asset conditions, changes, while also providing the rich context of the world around them. See statuses of coordination issues,

understand impacts to the greater natural and built ecosystems, and be able to tell the story of complicated infrastructure that depends on informed decisions you make with your greater team and community.



This becomes an easy way to share your progress with stakeholders so they can see it, they can believe in what you are trying to achieve, and you can just build it with everyone being on that same common ground.

To learn more about ArcGIS GeoBIM, head below [to get started!](#)



Vision for the Future to Promote a Sustainable World

Today, we see there are common benefits to working in BIM and GIS cloud collaboration workflows. Teams are experiencing...

- Easy, and immediate access to documentation managed in Autodesk Docs.
- Business insights on project performance and quality through ArcGIS views combining natural and built environments
- Savings in time and labor searching for relevant information and historical context
- Secure collaboration across systems that also enables feedback from more stakeholders
- Reductions in building custom development or unrepeatable solutions

Where should Autodesk and Esri go next on this integration of BIM and GIS? Well, that depends on our users like you!

Tell us about your ideas on how you would like to see your workflows improved. Head to this [survey](#), or QR below, to help us understand what new processes you would like to see developed next! If you would like to set up a future call to discuss your integration challenges and ideas, you can share your contact information with us in the survey and we can meet with you in the future.

Thank you for your work and interest in this technology interoperability, and we look forward to seeing your continued use of these workflows on your projects and asset operations.

