Getting Started:
3D Streaming Maps

CyberCity3D

YOUR 3D STREAMING MAP

Congratulations!

You have joined the rapidly growing trend of utilizing 3D Streaming Maps. Let's get started!

The purpose of this document is to enable you to make more effective and timely decisions and deployments through the use of 3D streaming maps.

Here's what you'll learn:

- How simple it is to set up a 3D streaming map
- How to access cloud-based services to connect with stakeholders 24/7
- How to budget time and resources for ultimate flexibility-- scale from a small project to a citywide information platform

A Little Background...

For years, CyberCity 3D, Inc.™ has been a leader in geospatial modeling, specializing in creating high-resolution 3D buildings for planning, design, and analysis. Our software can export these models to a variety of file formats, allowing clients to use them in multiple applications and platforms. In 2015, a groundbreaking collaboration expanded our mission.

The Genesis

In July 2015, CyberCity 3D and Analytical Graphics, Inc.® (AGI) formed a partnership to stream 3D buildings over the web from proprietary 3D building server technology on AGI's Cesium globe platform.

AGI-- headquartered in Exton, Pennsylvania-- develops commercial modeling and analysis software for the aerospace, defense, and intelligence communities. More than 50,000 engineers, operators, and analysts around the globe use AGI's software.

AGI founded Cesium and an active, open source community. Cesium® is an open-source JavaScript library for world-class 3D globes and maps. Utilizing state-of-the-art technologies like 3D Tiles and WebGL, CyberCity 3D and AGI can stream city-wide 3D models over the web on Cesium at blazing speeds with unheard of performance.

CyberCity 3D urban 3D content has the ability to stream to mobile devices such as Apple iPhones and iPads along with Android devices, enabling maximum 3D mapping consumption for authors of 3D maps. This ability extends to both government and private sector entities, no matter the size.

Another big plus: In today's web-based environment, Cesium is the only open-source platform that doesn't require a plug-in or a "client" download. With streaming map services, the goal is to operate everything within the cloud. There is no need for expensive software licensing or training. Users can publish GIS data generated from several applications including apps by Esri®, Autodesk®, SketchUp, Rhino, and other 3D GIS production tools.

After Cesium has been installed and all 3D and 2D map layers have been collected and processed, the streaming map is ready to be published. Once published, it can be accessed with a simple URL, and shared across all devices-- desktop, laptop, and mobile. To view examples of our 3D streaming maps, see the case studies at the end of this document.

Streaming Your 3D GIS Data on Cesium

A map is only as good as its data, and with Cesium, the possibilities are vast:

3D Buildings
The core of a high-powered, streaming urban 3D map on Cesium is CyberCity 3D buildings. From a small neighborhood to an entire city, we can stream our high-resolution 3D models for top performance visualization. Clients have the option of adding their own data attributes to the buildings, too, boosting map information for greater value. These buildings can also be part of your 3D geodatabase if you have an existing GIS infrastructure like an Arc GIS Server.

Other 3D Objects
In addition to CyberCity 3D buildings, Cesium is built to stream other 3D data such as tree models, billboards, street culture, and proposed property development. Architects, designers, and real estate developers can visualize buildings that don't yet physically exist to give stakeholders a feel for how they would work in the current landscape.

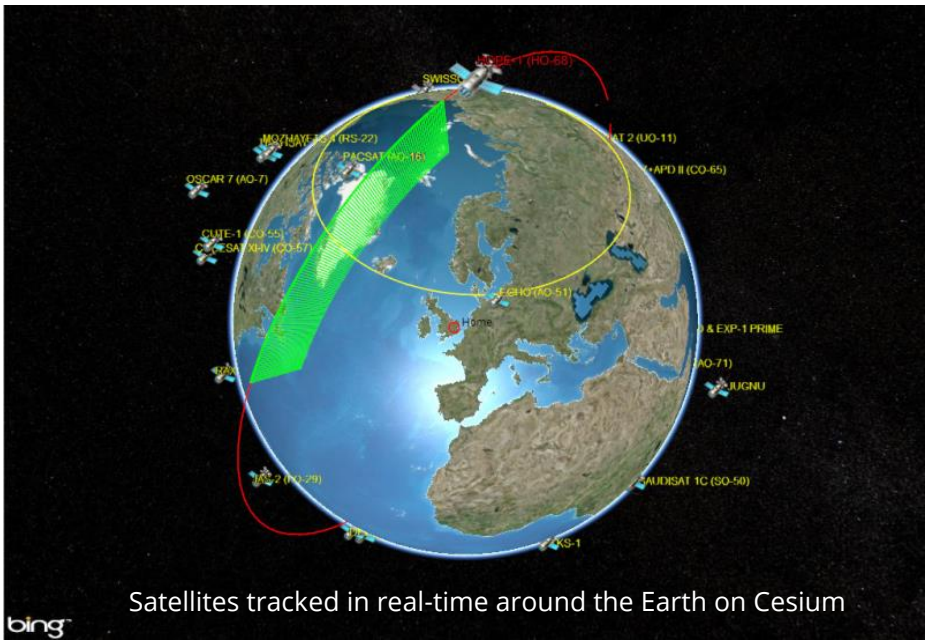
2D Vectors
With its powerful tiling technology, Cesium is optimized to process and display robust 2D data as well. Layers such as road lines, zoning polygons, and points of interest enhance the ways Cesium maps can be used across many industries.

Terrain
Users have the choice to upload their own Digital Terrain Model (DTM) to a streaming map as well. Terrains provide realistic elevation changes on which all other layers will "sit", adding to the real-world accuracy of a map.

Imagery
Cesium gives users several options for the base imagery of a map. From Bing satellite images to open-source alternatives such as OpenStreetMap and Stamen Watercolor, users can select their basemap on the fly to create different feels for the data. Cesium also allows users to upload their own high resolution orthophotos for proprietary imagery visualization.

Temporal Data
Finally, Cesium has the capacity to stream various time-dependent layers. For data objects that change over time (such as the position of a satellite), Cesium includes a timeline feature that enables users to see movement or modifications in information throughout a given period.

Powered by HTML5 and WebGL, Cesium includes a number of high-precision widgets, toggles, and navigation tools to ensure an optimized experience when utilizing the streaming map. No matter which data you choose to stream, Cesium delivers a 3D spatial experience like no other application. These options can be added to your CyberCity 3D work order on an as-needed basis.



Satellites tracked in real-time around the Earth on Cesium

BUILDING YOUR 3D STREAMING MAP

Summary of Services

Currently, the 3D map creation teams at both CyberCity 3D and Cesium hold distinct responsibilities for building a streaming map for clients. Please see the summary of each players' tasks in the tables below.

Note that these map creation services are typically performed by CyberCity 3D and Cesium. We handle the initial set-up for you to ensure best results.

Some of these steps can later be performed by the "client", dependent on your level of expertise. If you are feeling adventurous after the set-up and would like to experiment on your own – or, if you already have a developer on staff – go to the Cesium tutorial for information on self-hosting.

CYBERCITY 3D SET-UP SERVICES
3D building production
Building attribute table management
Other data collection (online sources, client, etc.)
Other data creation (hand modeling, digitization, etc.)
JSON conversions for vector data
Basecamp project management
Administration (licensing, billing, etc.)

CESIUM SET-UP SERVICES
3D building conversion & upload
Vector data conversion & upload
Terrain conversion & upload
Imagery conversion & upload
Joint conversion processing (buildings on terrain, vector data on terrain, etc.)
Creation of configuration files to support the conversion process
AWS streaming service management
GUI and layer styling management
Testing, troubleshooting & resolution

Creating Your 3D Information: Attribute Table CSV

All CyberCity 3D buildings published on a Streaming Map must include both 3D COLLADA models (.dae format) as well as an accompanying CSV table prior to upload. The .dae file contains the actual model that will be displayed. The CSV table includes information on the model's location, height, and other attributes. Each set of buildings typically has a folder structure as seen below:

The subfolder **dae_images** contains all texture images (optional). The subfolder **dae_models** contains a separate Collada file for every building. Finally, the CSV is a look-up table that contains information on placement and building attributes (usually named after the city which the dataset represents).

Every CSV file must have, at minimum, the following four fields (case-sensitive):

1-Dae_FileName
Text in this field must match one of the file names of the dae models in the **dae_models** subfolder. For standard CyberCity 3D building models, these unique file names are automatically generated when the Collada files themselves are created, and will typically read as the city name, followed by a EGID (i.e. Sacramento _0048621).

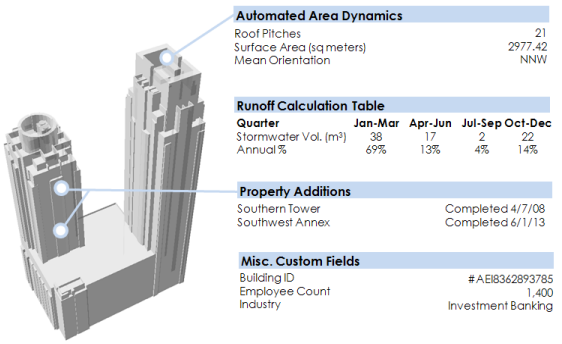
2-Height
This field identifies the height of the 3D model in meters. It is used to assign the optimal LOD "altitude" in which it will be displayed when zooming into the Cesium map.

3-Latitude
The latitude of the centroid of the 3D model in UTM WGS84

4-Longitude
The longitude of the centroid of the 3D model in UTM WGS84

Additional Fields
Beyond these four required fields, others can be added as attributes that will be displayed when the model is clicked and selected in Cesium.

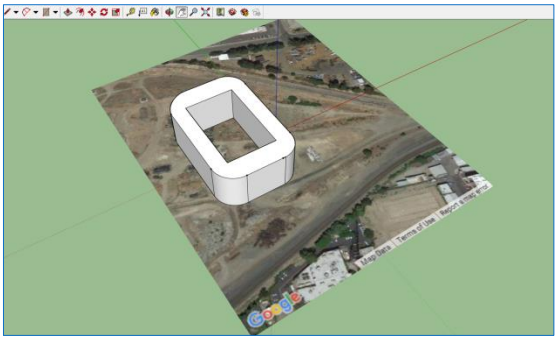
To do this, simply create a new header (i.e. *Building* Type) and populate the column's cells, assigning data to each building ID. When the number of buildings is large, a spatial join can be performed to save time.



Adding Custom SketchUp Models on the Cesium Map

In addition to standard CyberCity 3D building models, other 3D objects created in applications such as Autodesk 3ds Max® and Revit can be incorporated into a Cesium streaming map solution. For example: to add a 3D model created in SketchUp, follow the workflow below:

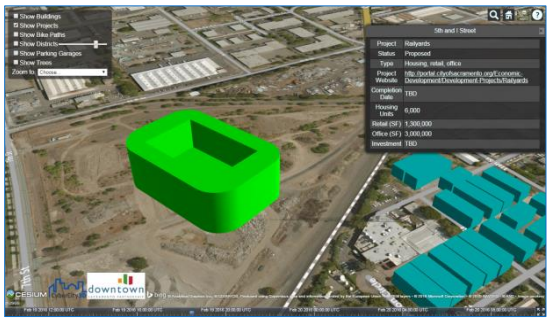
- Build a completed model in SketchUp.
- Click "add more imagery" button to place model on a 2D map clip.
- Select all 3D objects and "make group" to combine into single model.
- Export group as a 3D Model in KMZ format.
- Open KMZ in Google Earth™ to verify positioning and size. Close Google Earth.
- Make a copy of KMZ. Change extension of new KMZ from .kmz to .zip. This will create an isolated .dae model inside of the zipped folder.
- Create a new folder. Give it a name relevant to your project.
- Create a subfolder within this new folder. Name it **dae_models**.
- Drag the isolated .dae model into the newly created **dae_models** subfolder.
- Open Microsoft Excel.
- Create a CSV file in Excel following the steps outlined above:
    - For *Dae_FileName*, enter the name of the .dae file from above.
    - For *Latitude* and *Longitude*, copy coordinates from inside of KMZ file (open in Microsoft Word; coordinates are listed near the bottom of text)
    - For *Height*, measure the maximum height of the building from its base in SketchUp and record (in meters).
    - Add any additional attribute data fields to be displayed in pop-up window.
    - Save as a CSV file, place in folder with proper organization (including CSV and *dae_models* subfolder with .dae model inside).
    - Deliver to CyberCity 3D for upload onto Cesium.



Model Built in SketchUp with Imagery

	A	B	C	D
1	Dae_FileName	Longitude	Latitude	Height
2	railyards.dae	-121.491	38.5897	48.96

.csv & .dae created



Completed Model in Cesium

COMPLETION & CASE STUDIES

Innumerable Uses

Despite being available on the market for less than a year, our clients have found a number of high value uses for their 3D streaming maps. Take a look at a selection of case studies on the following pages, and click on any of the images to try out each map out for yourself. Please be sure to clear your browser cache prior to opening. We recommend you use Google Chrome for your browser.

Case Study 01 Miami DDA

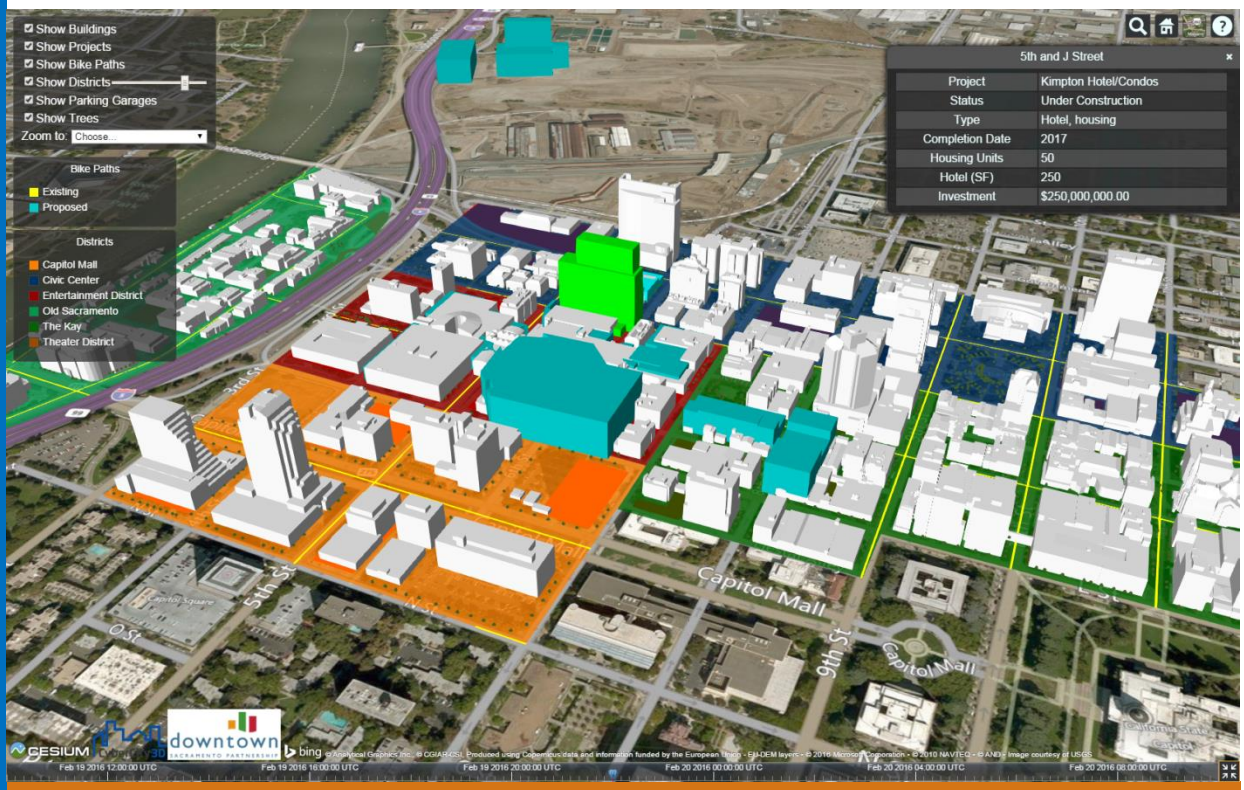
City
Miami, Florida

Map Size
17 sq km

Client Type
Downtown Development

The Miami Downtown Development District (Miami DDA) has maintained a rich GIS program for years, and had been experimenting with other systems prior to hearing about Cesium streaming maps. The Miami DDA map promotes economic growth and development across the city, and provides detailed information for each pipeline project.

» Open Map



Case Study 02 DSP

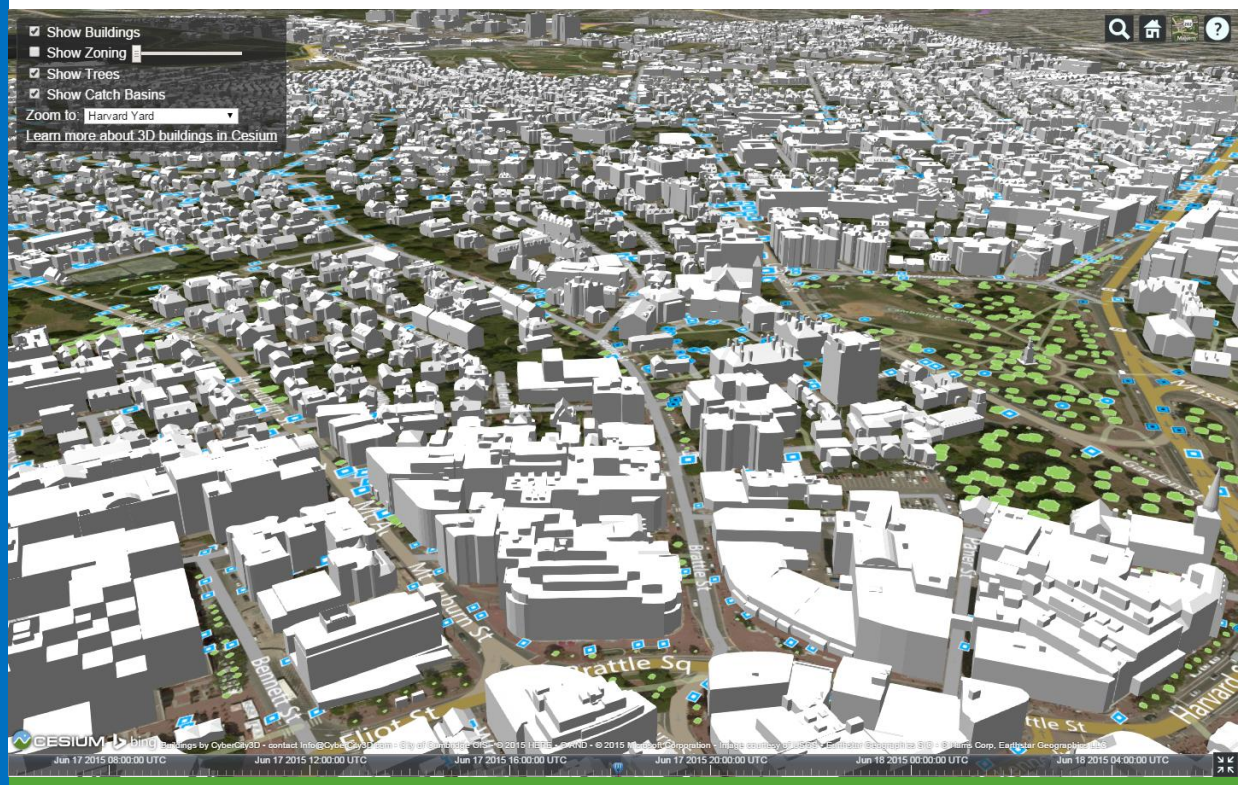
City
Sacramento, CA

Map Size
1 sq km

Client Type
Business Improvement District

The Downtown Sacramento Partnership (DSP) came to us in September 2015 to complete a streaming map of its downtown district. The DSP wanted a 3D map to take on its tours around town with potential investors—an invaluable tool to promote the city's progress and growth prospects. DSP also plans to include the map on its website to attract public interest and provide information on new development.

» Open Map



Case Study 03 Cambridge

City
Cambridge, Mass.

Map Size
18 sq km

Client Type
City Planning Department

The Cambridge City Planning Department, working with CyberCity 3D, considers 3D streaming maps an invaluable resource in making planning decisions, analyzing zoning requirements, and managing open space. The city intends to align its open data on Cesium for public access.

» Open Map

Case Study 04 State of Hawaii

City
Honolulu, HI

Map Size
32 sq km

Client Type
Various

The State of Hawaii ordered over 30 square kilometers of Honolulu to be modeled for public use. Several local organizations now leverage this high resolution 3D data in their solutions, including a Hawaiian construction company and an online marketing tourism firm. Uses include import of proprietary 3D building models, visualization of hotel units, and neighborhood-based analysis.

» Open Map

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