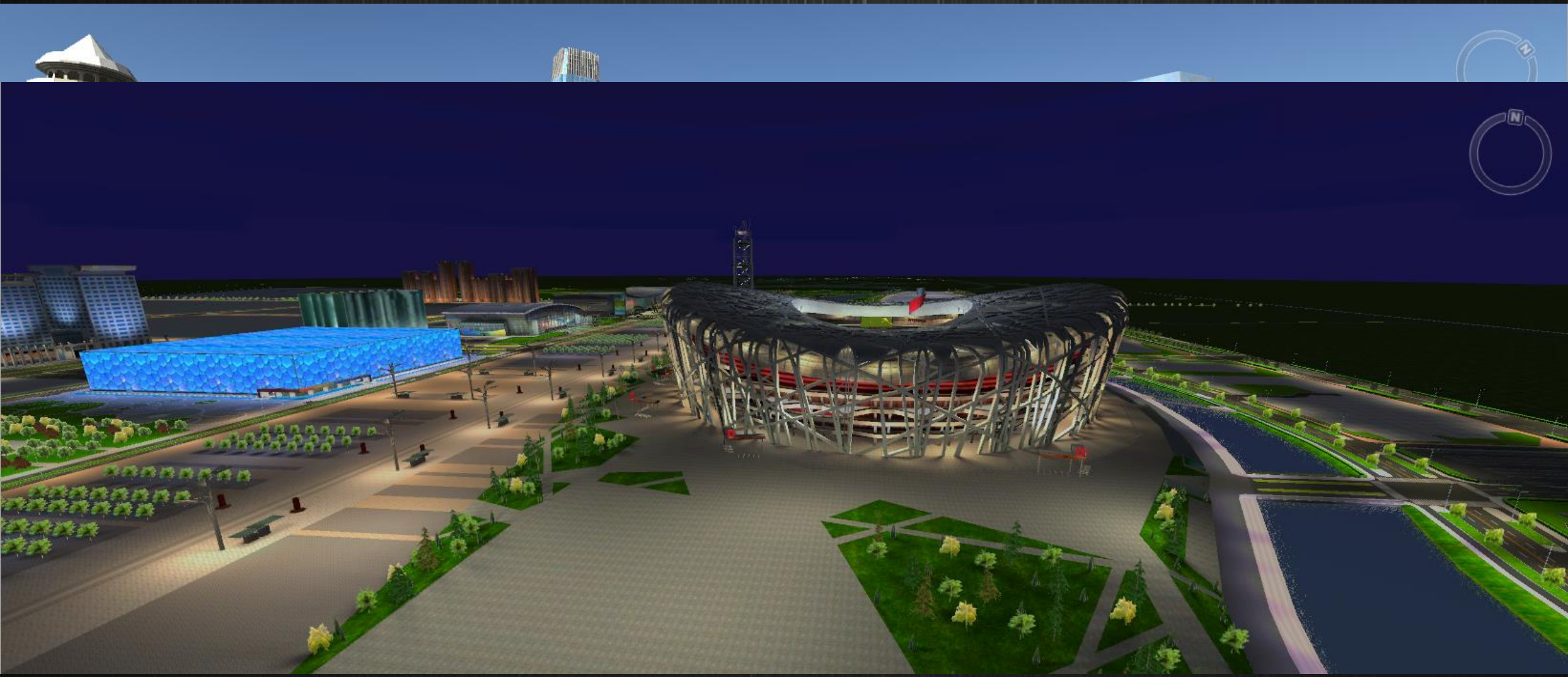
3D World Construction and Analysis

Zhuoyi Li

2020.12.16

- **What is 3D GIS?**
- **What are the types of 3D data and how to display them?**
- **What benefits can 3D data bring in real life?**

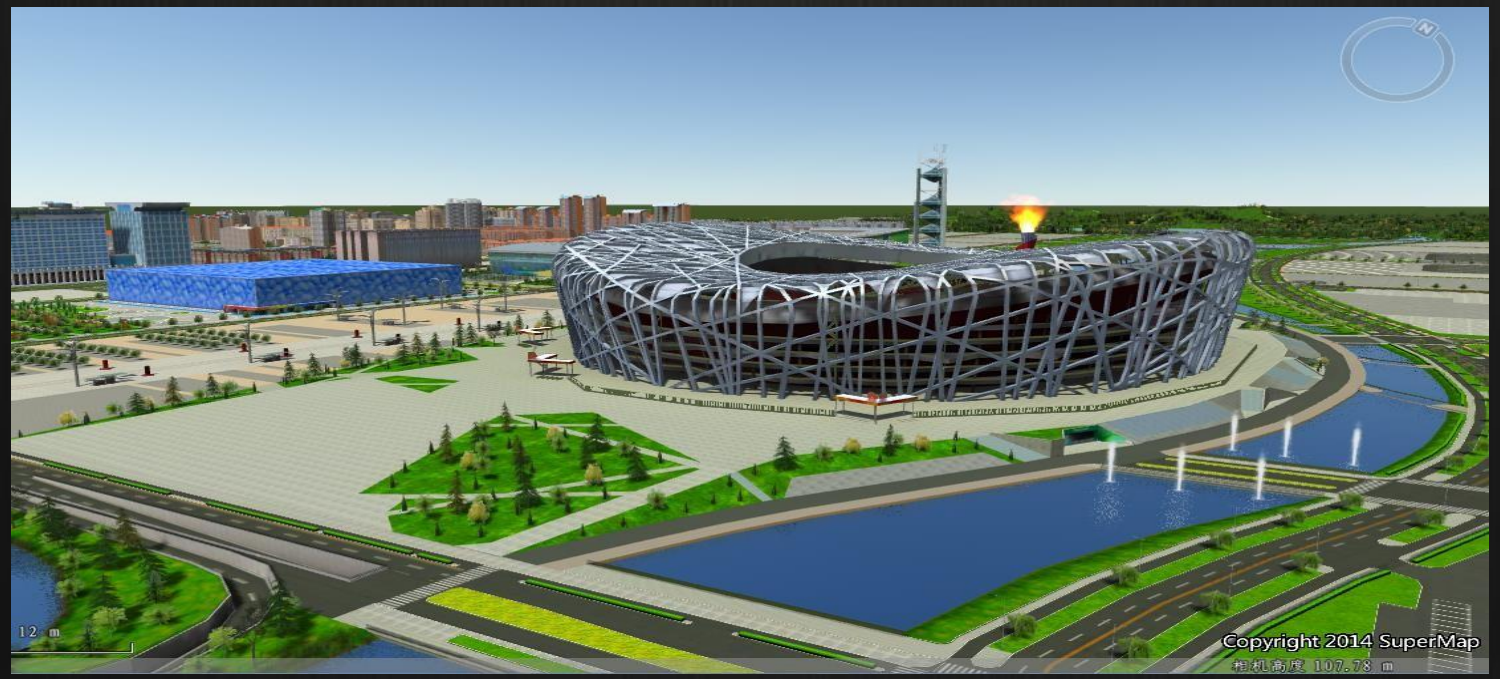
What is 3D GIS?



P4

3D Scene Introduction

- The 3D scene uses virtualized technology to simulate various geographic features and their spatial relationships in the real world.



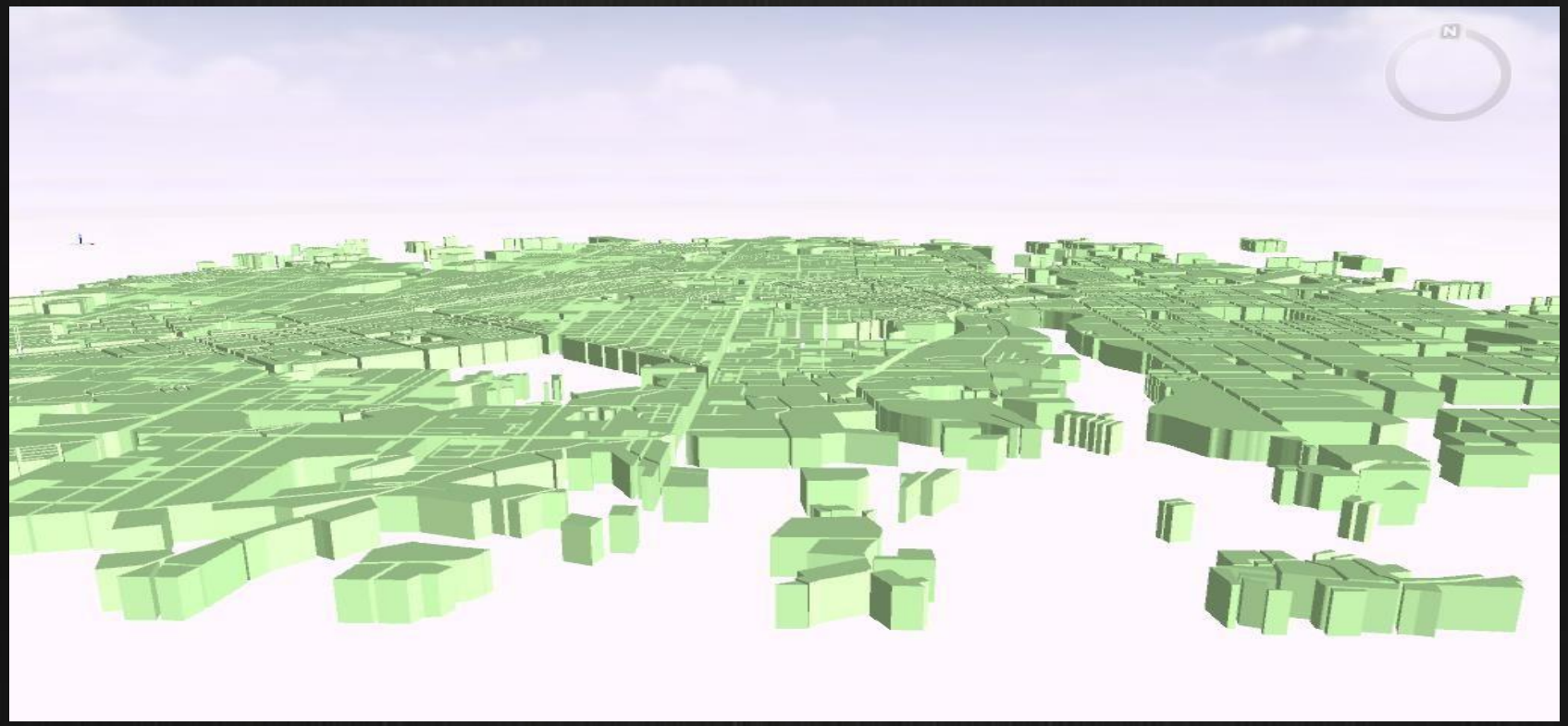
- There are two view modes of 3D scene, a plane scene and a spherical scene.

Spherical Scene

- The spherical scene simulates the surface of the earth.
  - Support loading data of geographic coordinate system and projected coordinate system
  - It can control the display and hide of the latitude and longitude grid, navigation compass, frame rate information and other elements

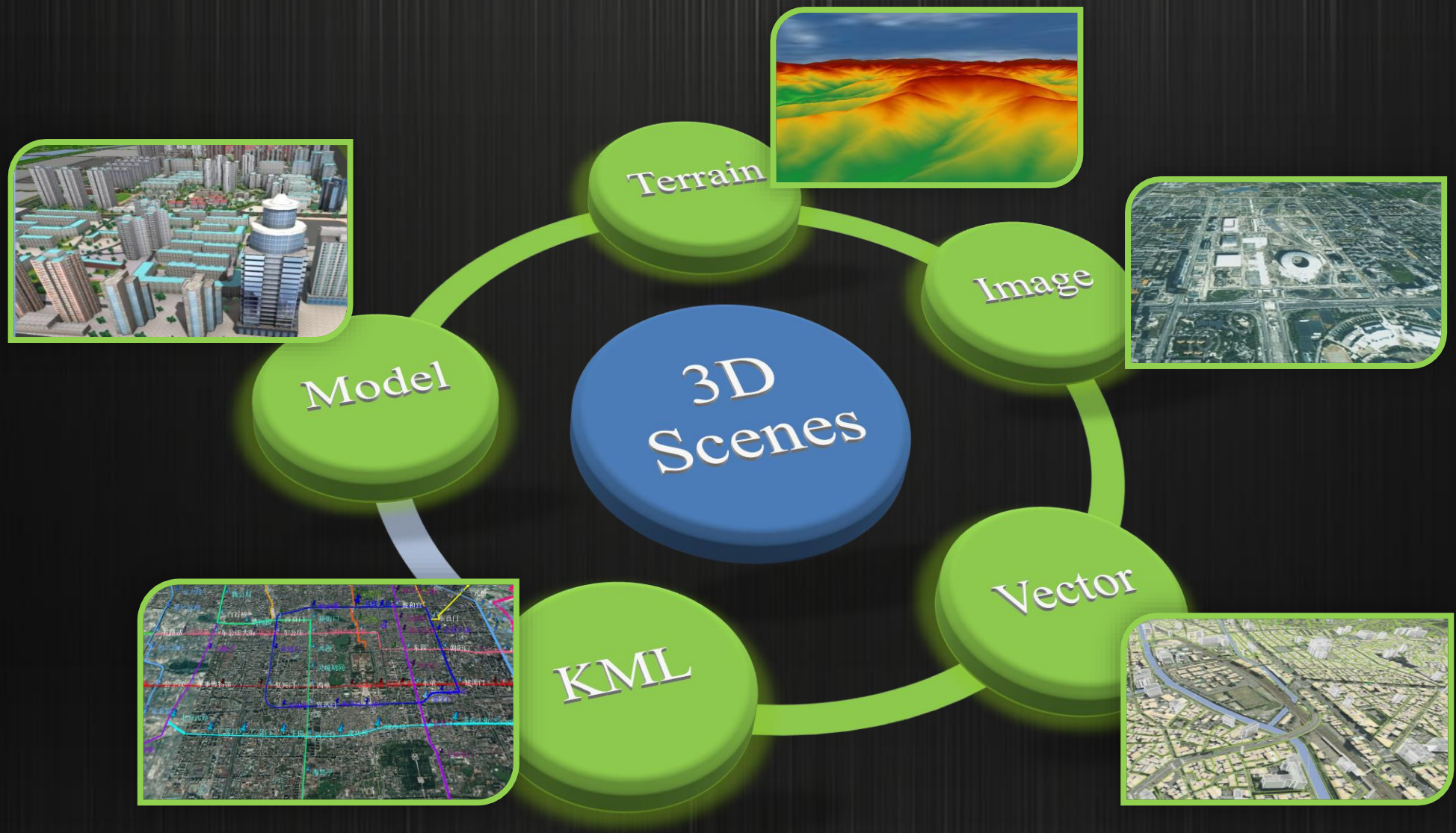
Plane Scene

- The plane scene is to simulate the spherical surface of the earth to expand into a plane
  - Does not support loading and creating new KML data
  - Planar Coordinate System data and Projected Coordinate System data are supported
  - To display the ocean, atmosphere, graticule or graticule label are not supported



What are the types of 3D GIS and how to display them?

Common Data Types in 3D GIS

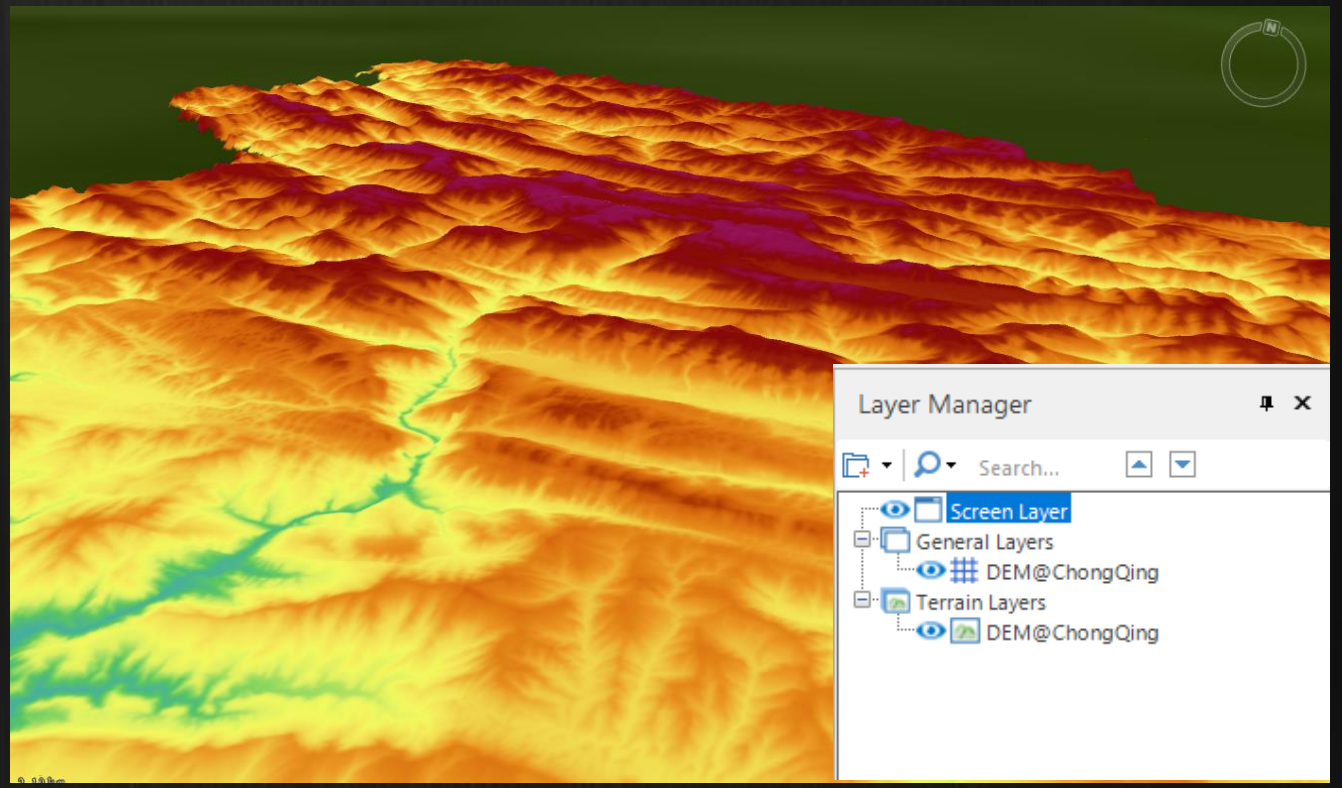


Terrain

3D Data Application Process

- Take the Terrain data application process as an example

Direct Loading



Vector(2D\3D)

Whether 2D data can be expressed in 3D?

Express through 3D layers

- Use 3D symbols to express 2D points, lines and water.
- Stretch and texture of lines and polygons in space.

Upgrade to 3D data

- Specify the elevation value to realize the upgrade to 3D data
- Extract elevation from TIN terrain or oblique photographic model data in the same area
- Give an elevation to the 2D polygon, then linearly stretch and map to generate a 3D entity model

Exercise

Data:

Vector stretch modeling → Symbol.udbx

Operation:

[Trees] layer to generate unique thematic map, and then render thematic sub-items in turn.

Vector Stretch Modeling

- Vector stretch data preparation

Step1

Data collection

- Make or obtain building vector dataset

Step2

Get texture

- On-site shooting or downloading building texture materials online

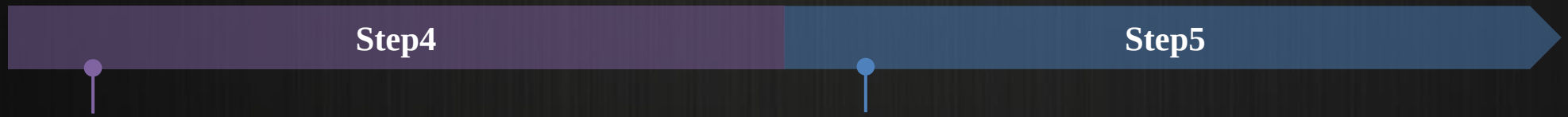
Step3

Edit image

- Correct the texture, adjust the angle, reduce the pixels, etc. in the software.

Vector Stretch Modeling

- Vector stretch data preparation



Add field

- Add data set fields, including the bottom elevation of the building, stretch height, etc.

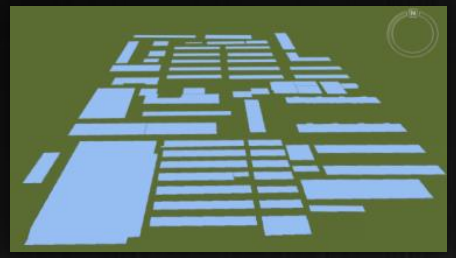
Edit data

- Enter field values separately and save data

Note: The texture path is generally a relative path, that is, the path of the texture file relative to the workspace file.

- **Dynamic stretching operation method**

1 Add Data

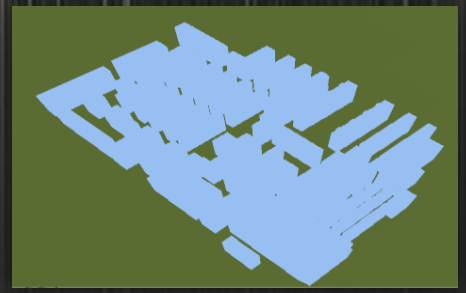


2 Modify the height mode

- Style Settings> Height Mode> Absolute Height / Relative Ground
- The altitude mode depends on whether the data used is the actual measured altitude value or the altitude value relative to the ground

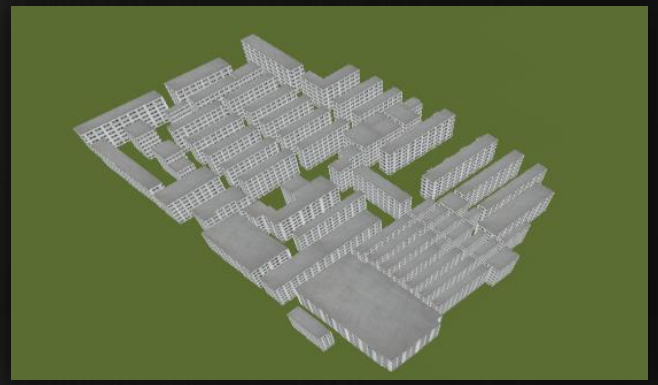
3 Set bottom elevation

- Style settings> Bottom elevation> Input value/field
- When manually entering a value, all objects in the layer have the same bottom elevation
- When taking values from fields, the elevation values of objects in the layer can be different



4 Set the stretch height

5 Set the texture



Exercise

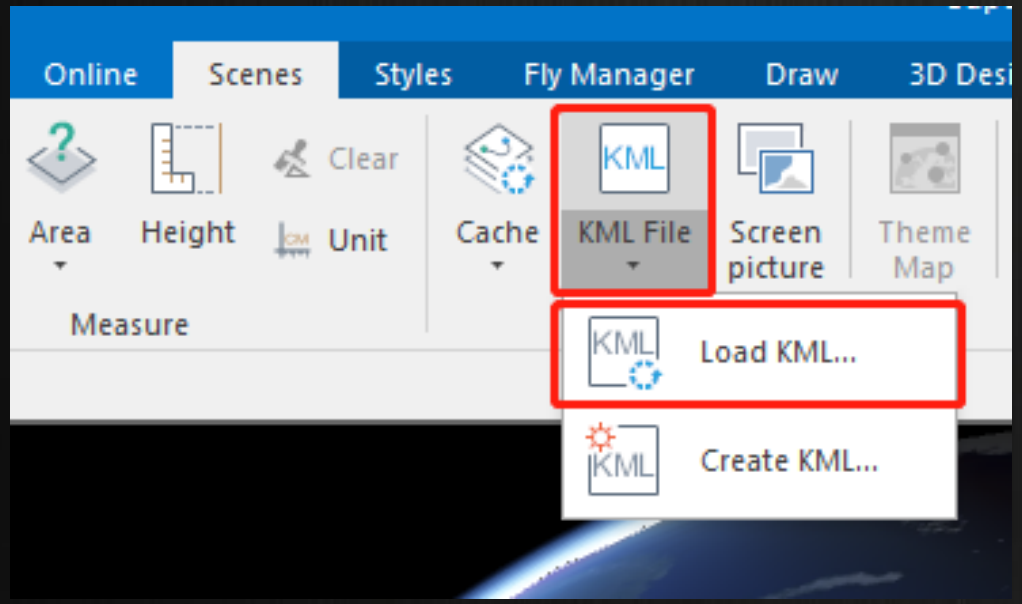
Data： Vector stretch modeling →ModelingAndAnalyst.udbx
Texture

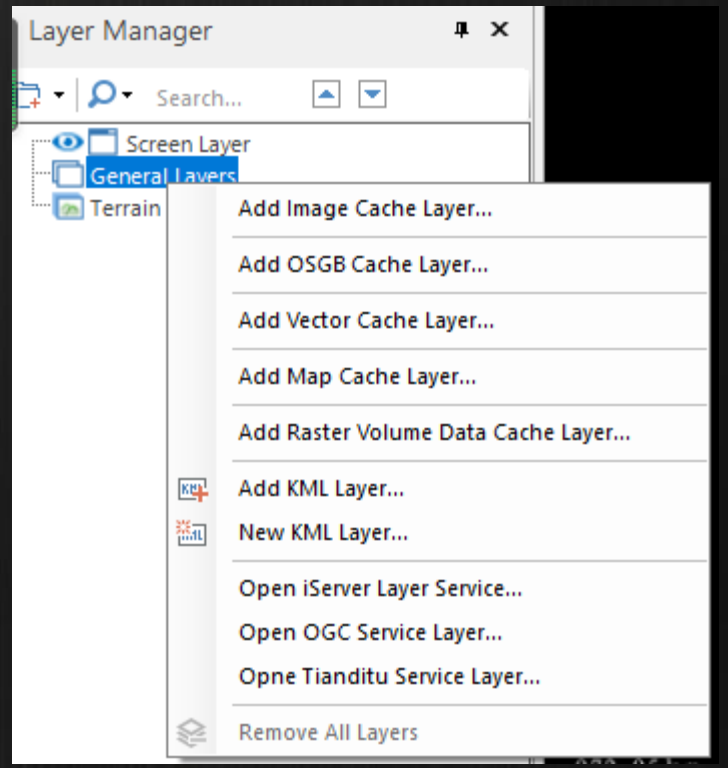
Operation: [ModelRegion] Layers to achieve stretching modeling

KML

KML Layer Loading Method

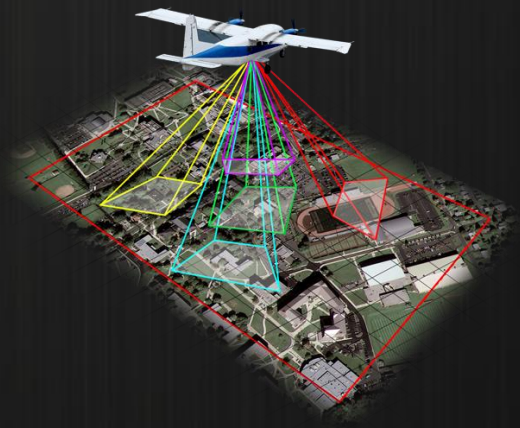
Scenes → Data → KML File → Load KML…
General layer→ Right-click menu →Add KML layer





Model

BIM



Oblique Photogrammetry

BIM Model

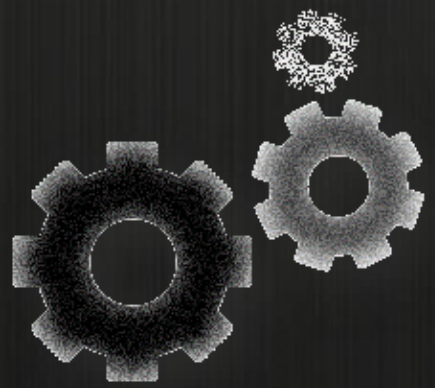
AUTODESK REVIT

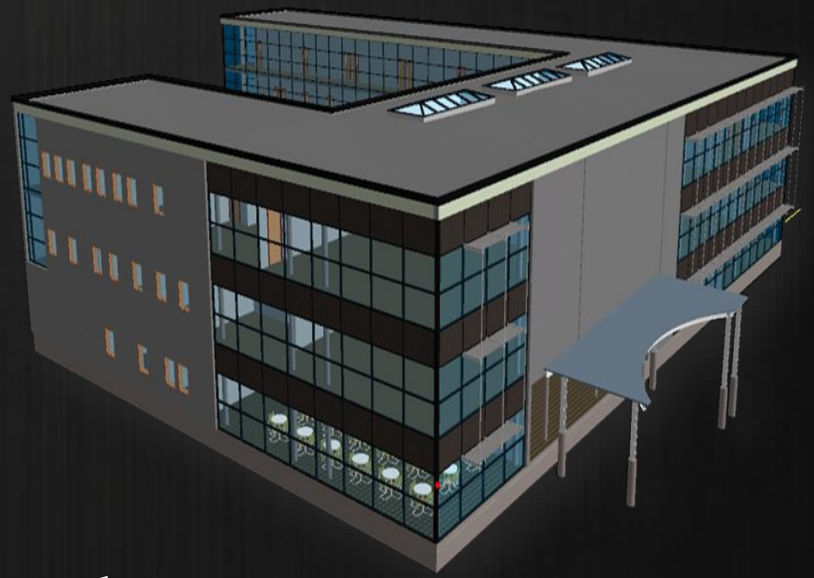
Bentley Advancing Infrastructure

CATIA

AUTODESK CIVIL 3D

IFC

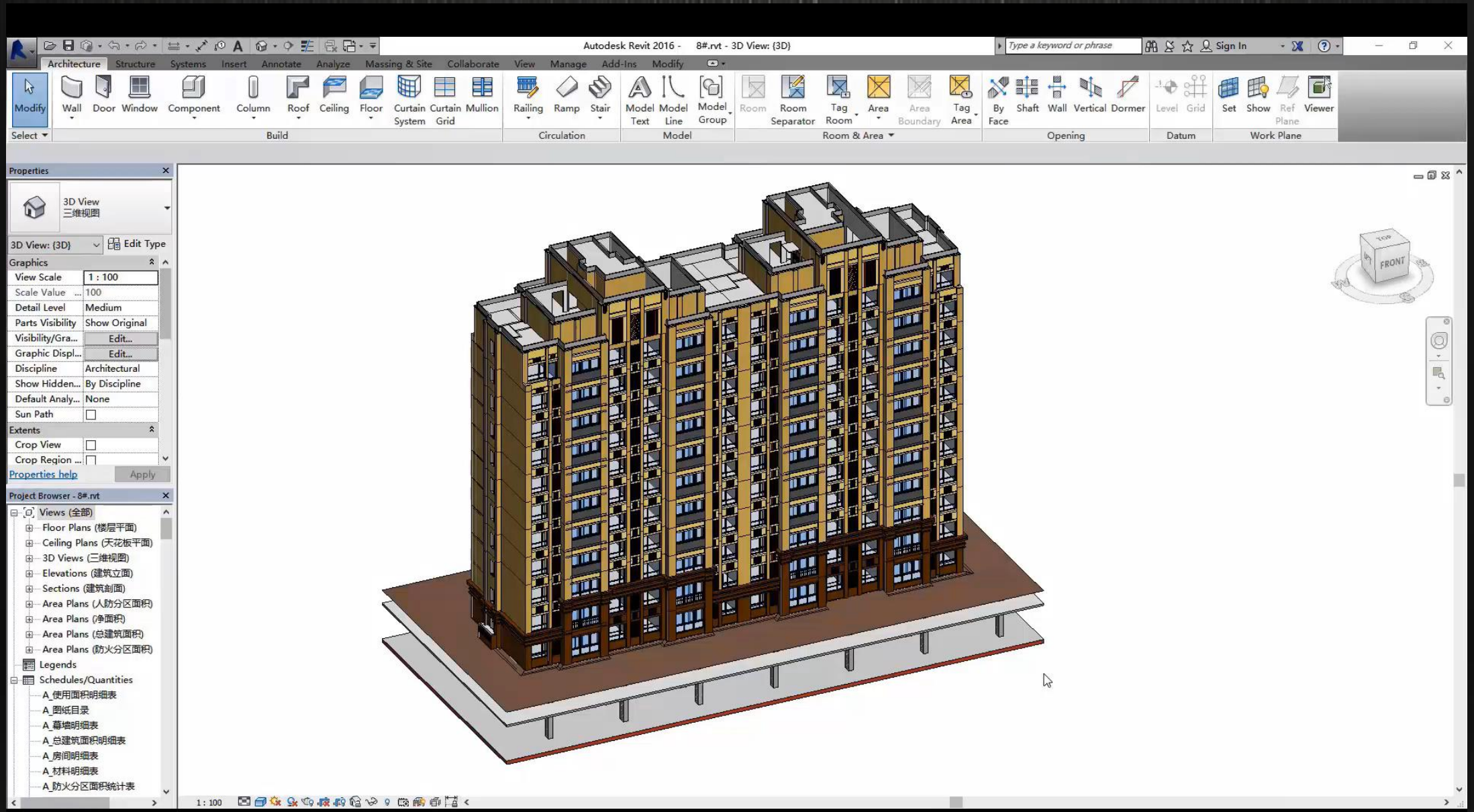




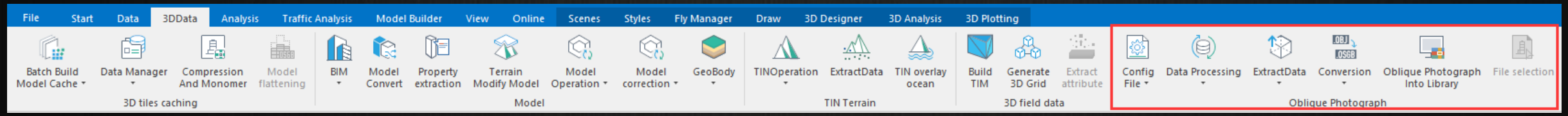
3D Entity Model

- SuperMap iDesktop direct import
- Plug-in export & Format conversion tool

Revit Plugin



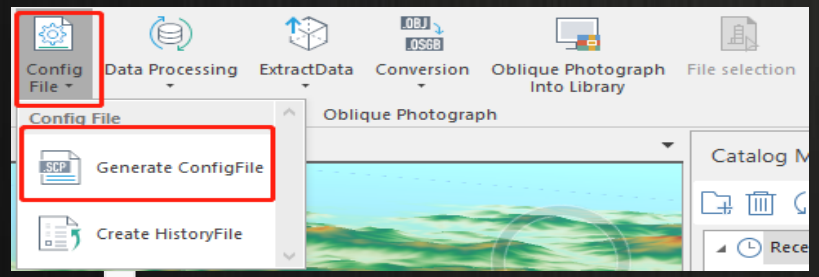
Oblique Photogrammetry Toolbox (iDesktop)

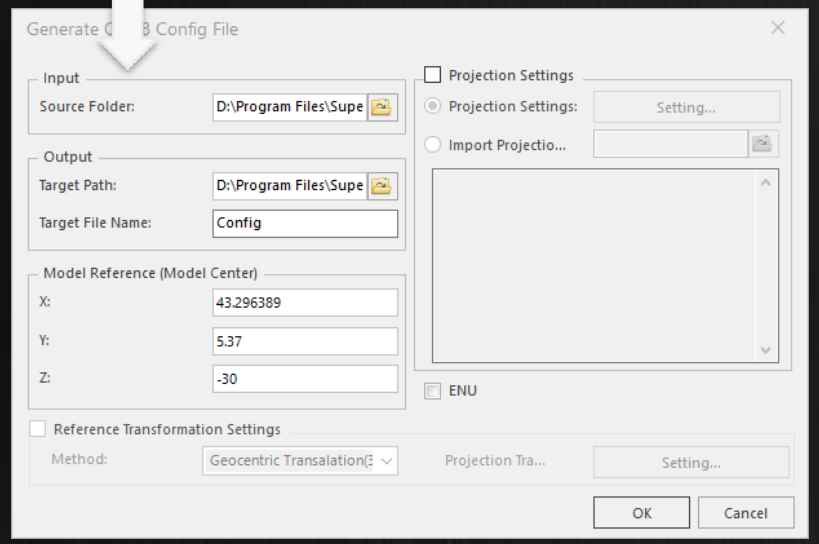


P24

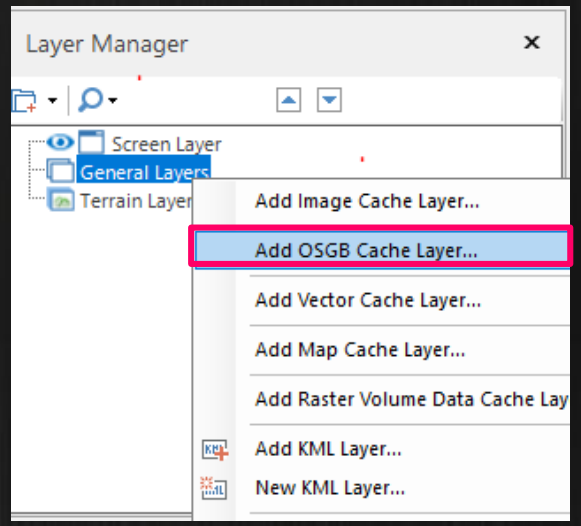
Oblique Photogrammetry Data

- Generate the configuration file and read models through the configuration file





*.scp

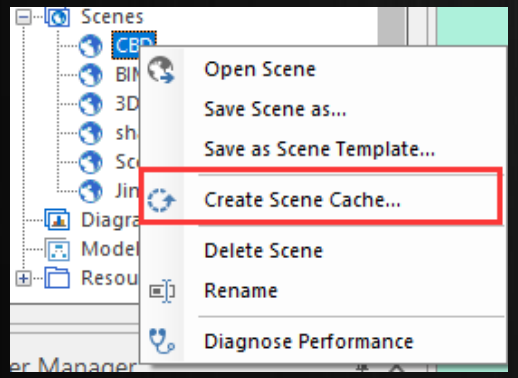


P25

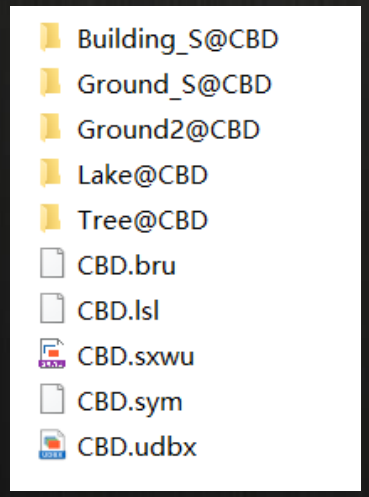
Browse 3D data
-3D caching strategy

3D Data Application Process

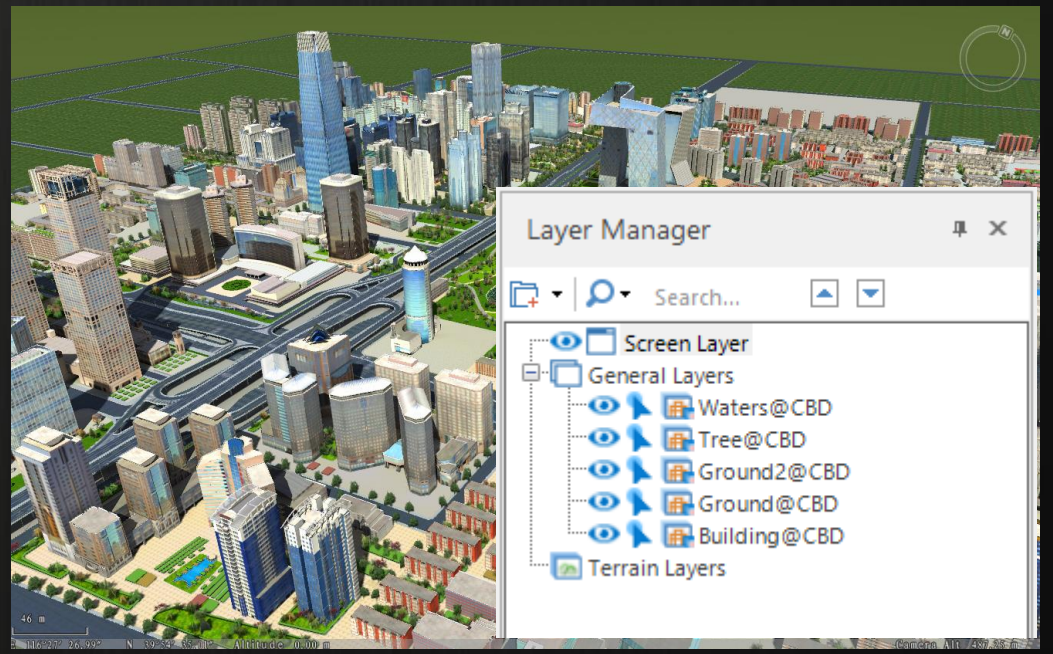
- The 3D tile cache is used to improve the display efficiency of data in the scene.



Process Optimiz-ation, Cut cache



Load cache



What benefits can 3D data bring in real life?

Exercise

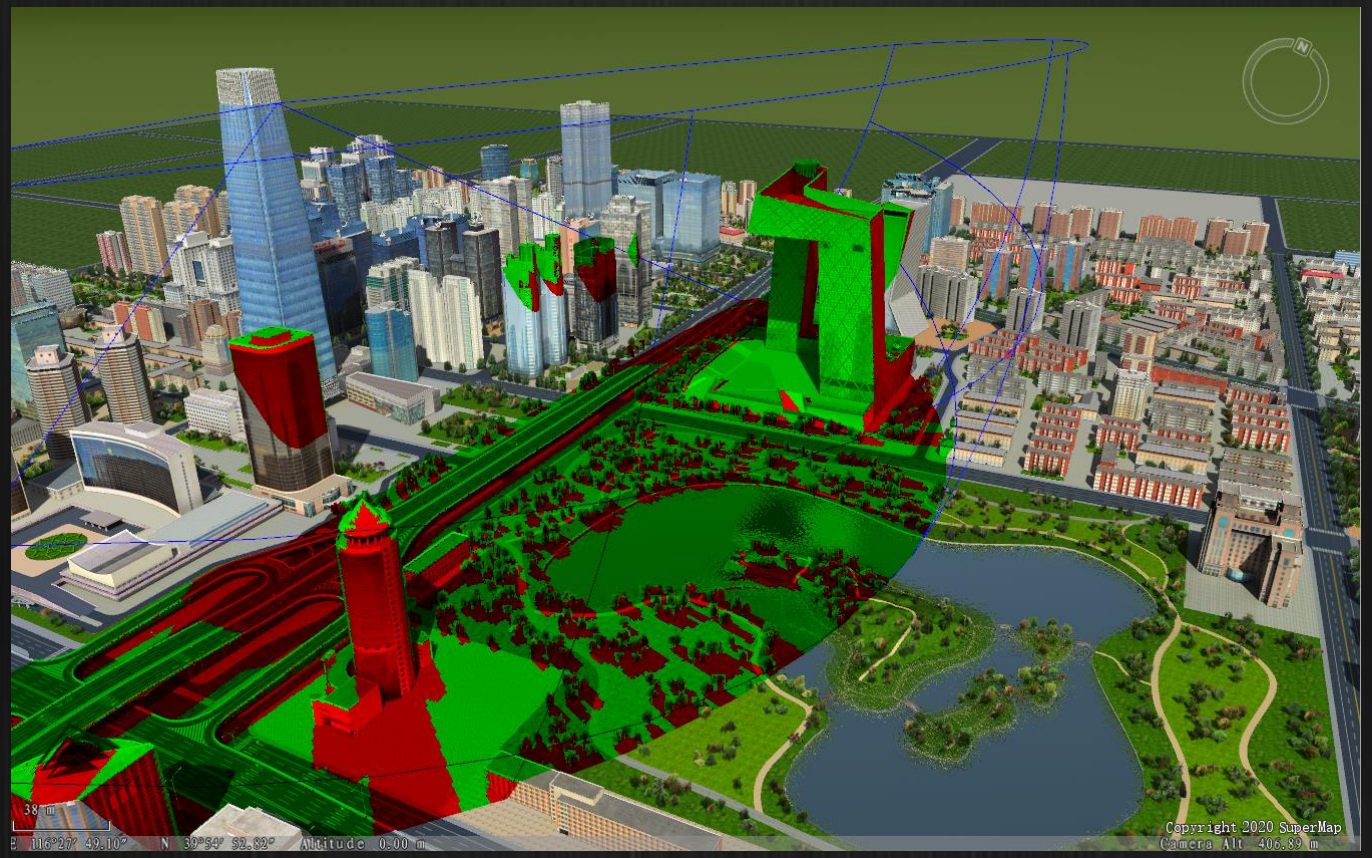
- Data: Model DataSet (Beijing CBD)
- If you come to Beijing for the first time, you have found the restaurant on the 79th floor of China World Trade Center and want to see the view of Beijing CBD.
  1. You want to know if you can see the pavilion of the park.
  2. You want to know what areas you can see and what areas you cannot see.
  3. You want to know what time to go to enjoy the sun.

Visibility Analysis

- Often used in 3D analysis, this function is used to determine whether certain locations in a 3D scene are visible to the observer location.

Viewshed Analysis

- This function is used to identify all the visible and invisible ranges in the analysis area of a scene.



Trajectory

- The Trajectory button is used to set the trajectory of the sun effects.

Quiz

- Link: https://forms.gle/1ed3RCetjedbQ39n7
- You need to type your name and email address to receive test score.
- The types of questions include single choice, multiple choice, and upload your map.
- Time: Any time during our class, 20 minutes to answer and check.
- You could try multiple times and we will get your highest score.

Reach us here!

Thank You!