

# Avineon Produces CityGML Models for Kowloon East, Helping Transform Hong Kong into a Spatially Enabled Smart City

iTwin<sup>®</sup> Capture and MicroStation<sup>®</sup> Reduce Project Costs by 15% and the Carbon Footprint by 5%

## A 3D DIGITAL MAPPING INITIATIVE

To improve urban planning, development, and disaster management, the Hong Kong government is aiming to make their cities smarter through a 3D digital mapping initiative. Adopting an incremental, phased approach to implementation, they are piloting their 3D visualization map in East Kowloon, a former manufacturing epicenter and industrial district that is set to become Hong Kong's first smart city. The project requires producing full-scale CityGML models covering the buildings and infrastructure of the entire area. Hong Kong Lands Department is overseeing and managing the project, while global geospatial, engineering, and information technology provider Avineon India (Avineon) is responsible for processing and creating the 3D city models.

The scope of the work involved generating individual 3D photorealistic models and developing a showcase platform. "The primary objective of the project is to develop Hong Kong into a spatially enabled smart city, including the adoption of building information modelling (BIM) and the development of common spatial data infrastructure (CSDI) and a 3D digital map," said Govardhan Jutla, general manager, 3D geospatial services at Avineon. The 3D virtual models and digital map will support the city in land utilization analysis, improve capabilities responding to natural disasters, and impact various facets of urban life, fostering public engagement, promoting tourism, and preserving cultural heritage. In short, the digital map will play a crucial role in shaping the city's future.

## INTEGRATING VOLUMINOUS MULTISOURCED DATA

"3D city modelling projects often involve managing vast amounts of data from various sources and in various formats," said Jutla. Hong Kong's CityGML

project was no different. Avineon faced data management, integration, capture, validation, and migration issues, amalgamating an extensive array of data from diverse sources, including aerial imagery, LiDAR, mobile imagery, and as-built drawings. Each data type was captured by different technology in varying formats and at different points in time. This variety presented challenges with preserving the geometric, topological, semantic, and appearance properties of the data during integration within a single environment, affecting the accuracy of the models and impacting their compliance with Open Geospatial Consortium (OGC) standards.

"We tried to use 3D modeling software like Rhino city to integrate the data from various sources in a single environment... Due to limitations in the technology, we couldn't reference all the sources at a single instance to create accurate 3D models and export valid CityGML models as per OGC standards," said Jutla. To streamline data integration and processing, minimize manual, time-consuming efforts, and overcome the constraints of non-3D modeling software, such as geospatial information systems (GIS) and CAD software, Avineon needed a connected data capture, processing, and 3D modeling solution.

## ESTABLISHING A SINGLE, UNIFIED DIGITAL ENVIRONMENT

Avineon selected iTwin Capture and MicroStation to process voluminous data and generate the CityGML models, facilitating automated workflows in an integrated digital environment. Working in Bentley's unified platform enabled seamless integration of different attribute data in various formats, improving data consistency and model accuracy. The software enabled Avineon to load and process huge LiDAR point cloud data of

## PROJECT SUMMARY ORGANIZATION

Avineon India P Ltd.

## SOLUTION

Surveying and Monitoring

## LOCATION

Hong Kong SAR, China

## PROJECT OBJECTIVES

- ◆ To establish a single digital environment to capture, process, and model city buildings and infrastructure.
- ◆ To support Hong Kong in its smart city initiative for urban planning, development, and disaster management.

## PROJECT PLAYBOOK

iTwin Capture, MicroStation

## FAST FACTS

- ◆ Avineon developed 3D CityGML models for Hong Kong's 3D digital mapping and smart city initiative.
  - ◆ The project required data integration between multiple survey and modeling technology in different formats.
  - ◆ Avineon used iTwin Capture and MicroStation to establish a single unified digital platform.
- ## ROI
- ◆ Bentley's advanced modeling applications automated and streamlined data workflows, saving 20% in processing time.
  - ◆ Avineon reduced costs by 15% and the carbon footprint by 5% throughout project delivery.



“Bentley applications provide a clear and realistic representation of the city, aiding in better decision-making and reducing the likelihood of costly or environmentally damaging mistakes.”

– Govardhan Jutla, General Manager, 3D Geospatial Services, Avineon India



roof features and façade details to a high degree of precision. The digital applications provided advanced visualization, analysis, and 3D modeling capabilities, ensuring the creation of precise 3D city models while adhering to OGC standard CityGML 2.0 format specifications. “The customized CityGML export [feature] in MicroStation helped us migrate the high-accuracy data created/processed within MicroStation to a CityGML 2.0 format, [without] any loss in spatial, appearance, or attribute accuracy,” said Jutla.

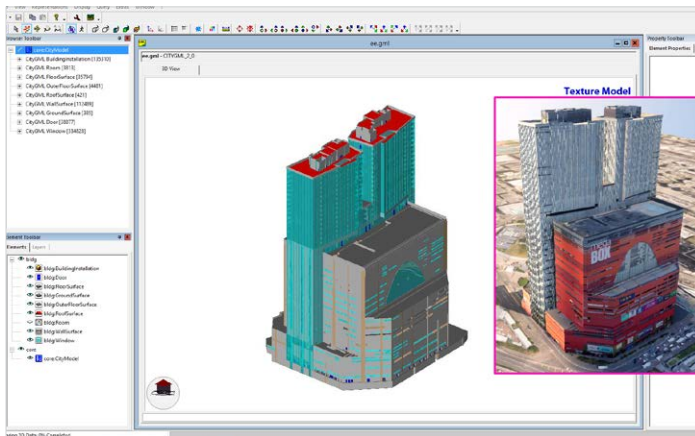
Leveraging Bentley’s modeling applications provided essential functionalities for aligning, validating, managing, and seamlessly integrating data. The connected digital solution improved data consistency geometrically, topologically, semantically, and in terms of the texture appearance of the model. “Bentley’s applications offer data management and integration capabilities, allowing engineers to effectively organize, capture, validate and produce desired output data,” said Jutla. Facilitating seamless collaboration and integration of data within the project, the applications are compatible with a diverse range of Bentley and third-party technology, ensuring a smooth exchange of data and models across various software and disciplines in a unified digital environment.

### DRIVING SAVINGS AND SMART CITY APPLICATIONS

The integrated workflow offered by Bentley technology facilitated seamless integration between different technologies and data formats, allowing for efficient data capture in a 3D connected environment, with reference to LiDAR point clouds and a 2D basemap in one platform. “This integration

helps improve accuracy, reduce errors, save time, and improve overall project efficiency,” said Jutla. The applications provide a clear and realistic digital city representation, facilitating timely, cost-efficient, and eco-friendly decision-making for urban planning, development, and disaster management. By establishing automated data and modeling workflows in a single platform, Avineon significantly decreased manual efforts on the project, estimated to save approximately 15% in work hours. The digital solution also cut processing time by 20% and reduced costs by 15%, while improving quality by 25%. Working in a collaborative platform allows stakeholders to view, assess, and provide feedback on the 3D city models from remote locations, reducing transportation needs and the project’s carbon footprint by 5%.

The 3D CityGML models provide the essence of East Kowloon’s 3D digital map, which serves as one of the prime elements for developing a smart city and a digital Hong Kong. The map forms a major building block of Hong Kong’s CSDI portal, aiming to provide government departments, as well as public and private organizations, with an information infrastructure to promote the sharing of spatial data and support the development of various smart city applications. Using Bentley software and advanced survey and mapping technologies, Avineon delivered an accurate portrayal of physical city structures as a 3D virtual CityGML model, transforming the existing, traditional 2D representation of East Kowloon. “The attribute-based spatial objects in the 3D digital map are the core components in the next generation of geospatial applications for the greater benefit of the community,” said Jutla.



Avineon developed 3D CityGML models for Hong Kong’s 3D digital mapping and smart city initiative.



Bentley’s advanced modeling applications automated and streamlined data workflows, saving 20% in processing time.