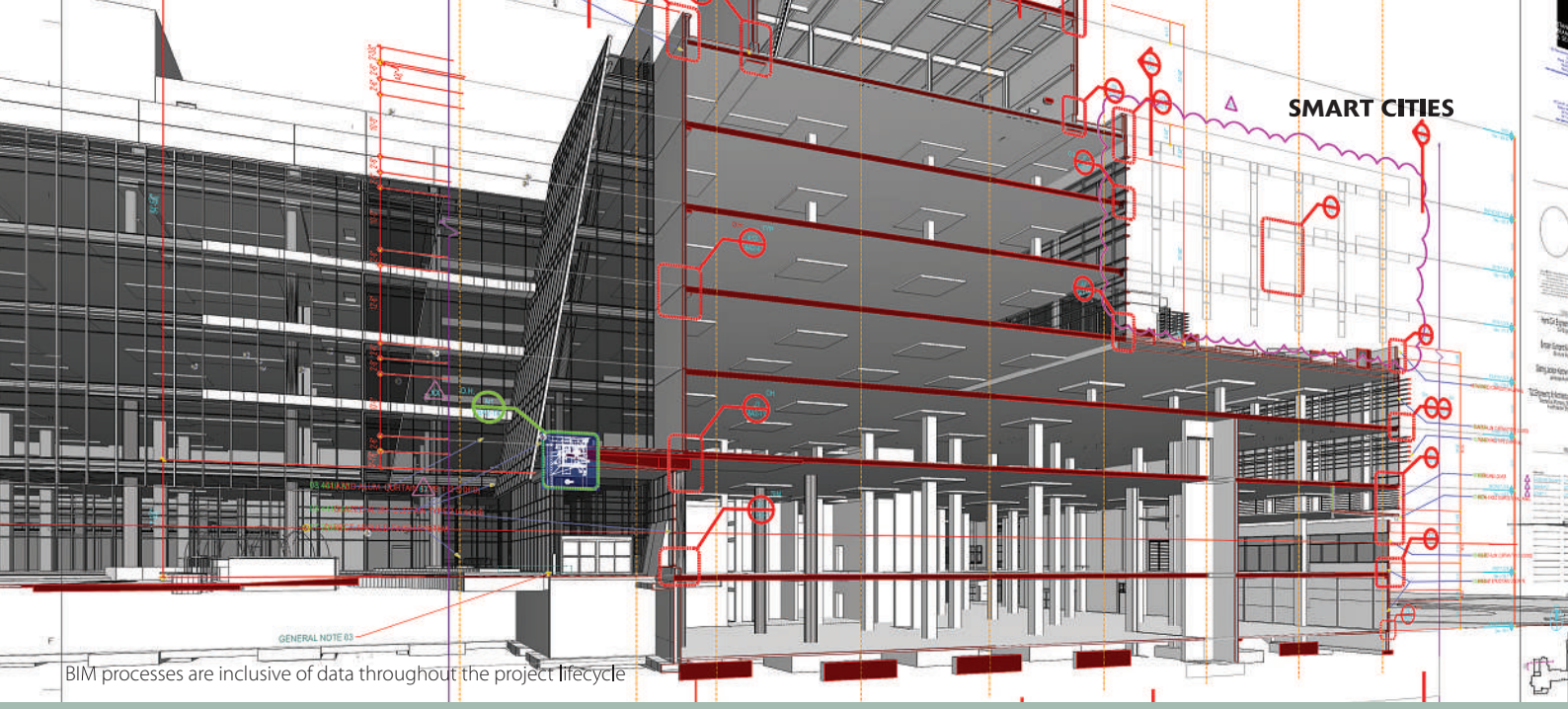


BIM processes are inclusive of data throughout the project lifecycle

SMART CITIES NEED SMART WAYS OF WORKING

INTEGRATING GEOSPATIAL TECHNOLOGY WITH BIM PROCESSES IS KEY IN ACHIEVING SMART CITIES, ARGUES AIDAN MERCER

Since the inception of CAD and GIS, users have adopted technology to better deal with infrastructure projects around the world. With the rise of building information modelling (BIM), a concerted effort has been made to integrate differing disciplines to benefit all parties to ensure better team collaboration, improved quality of infrastructure, and to design, build, and operate more efficiently.

What we have to acknowledge is that BIM processes are not just about the design or the models themselves. It is all-inclusive of design through to operations and maintenance of assets, and has been eloquently described by Mott MacDonald as "a coordinated set of processes, supported by technology, that adds value through creating, managing and sharing the properties of an asset throughout its lifecycle."

By accepting that it is a process, we should accept that the technology is only one component. Another thing to consider is the people and skills needed for such an integration. GIS professionals have a broad range of management, business and technical skills in the fields of database management and administration, data development, system administration, technical consulting, software development, third-party system integration, marketing and training, and design and implementation of GIS standards. BIM advancements are giving professionals who are often technically savvy the potential to adopt new sets of technology in innovative ways.

The objectives and potential benefits could not be clearer – provide better integration for smarter infrastructure. The difficult part is integrating the differing technologies that have so far operated in different environments.

It is, however, imperative that software vendors should work on the exchange of data between varying systems, such as by using i-models. Given that a BIM methodology is not a static model created for one purpose, it is important to see the value of how these methodologies can complement one another. For example, a BIM methodology, inclusive of the models that enable better processes, should be ascribed throughout with geospatial information in order to gain additional value. For example, the topology of a building is required to spatially understand the layout and attributes of that building, thus giving a heightened importance to this integration.

Questions

This growing importance of having a geo-context to the architecture, engineering and construction (AEC) lifecycle is becoming more evident and the demands on various communities are growing at a rapid rate. But the issues of integration raise some significant questions due to a variety of factors.

For example, a GIS is typically user-defined, server-based, parametrically loosely structured and typically 2D. GIS technology integrates database operations such as data storage and quality control and can query with spatial and statistical analytical capabilities for visualisation and geographic analysis of geospatial data.

Fundamentally speaking, existing CAD and GIS platforms have been developed independently with different purposes. A BIM methodology is typically more standardised in structure, more highly structured and is file-based (hence the need for i-models). Given that CAD and GIS platforms have been created for differing purposes, one key word is needed to deal with this integration – interoperability. This means being interoperable with technology and each other.

Defining a standard format is fundamental to any successful integration plan. The industry foundation classes (IFC) data model has provided a solid foundation and offers great promise of interoperability for the AEC community. IFC schema have developed new geographic elements within IFC itself and ensured, with the help of new computing powers, that 3D GIS is now possible. This opens up a whole new potential with 3D analysis and simulation for energy performance, urban planning and development, and a new wave of cadastral mapping and registration. These standards and initiatives are contributing to the smart city objectives by improving methodologies

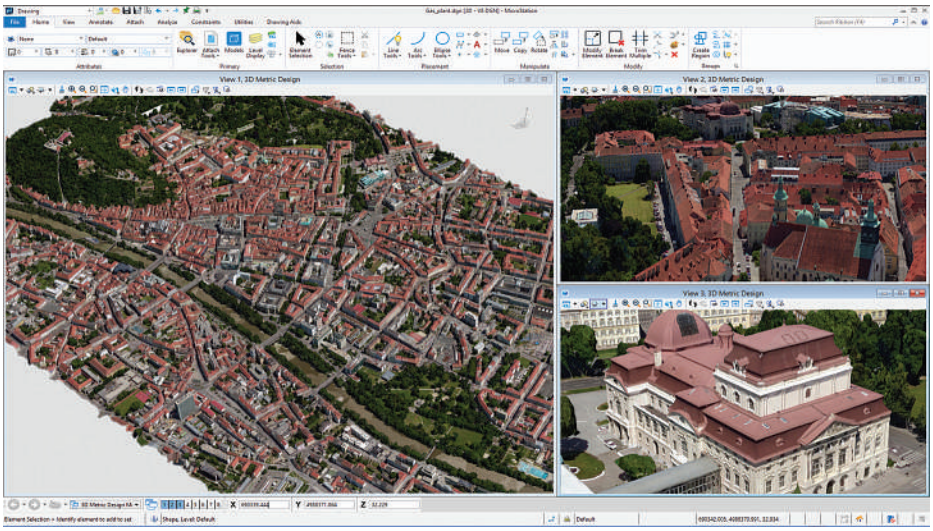
Bentley users at Abu Dhabi Midfield Terminal Building have adopted BIM processes

and delivering efficiency savings by being more open and collaborative.

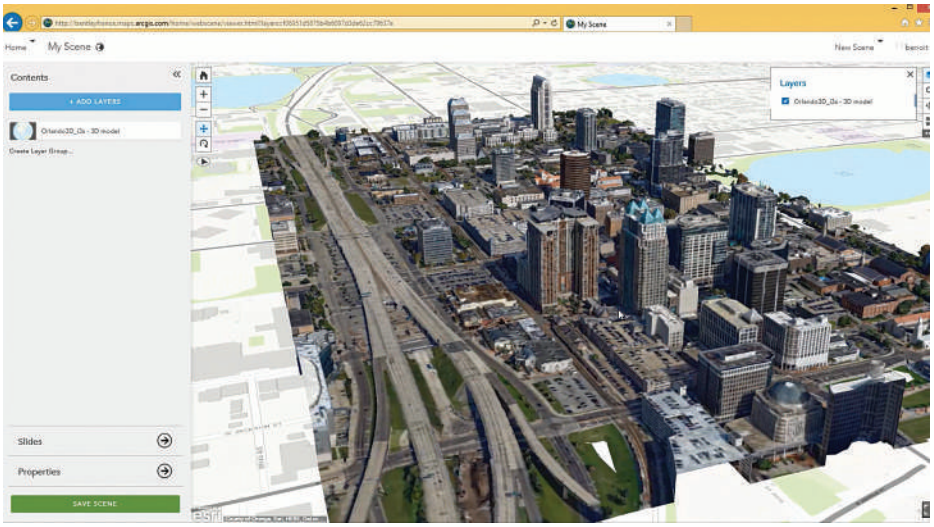
CityGML has been developed as the Open Geospatial Consortium standard for describing such things as 3D urban objects as application schema and comprises different thematic areas. Although the model is an XML format, it is geometrically compatible with Oracle Spatial for RDBMS.

Such standards provide the framework for semantic and geometric relationships and have the functionality of representing differing levels of detail required for complex infrastructure projects. These standards can also ensure the same object is represented in different levels of detail simultaneously.

Ultimately, any meaningful attempt to integrate BIM processes and GIS requires a systematic mapping of conflicting semantic data structures. BIM processes have new and differing levels of structure (BIM Level 1, 2, 3), and are by nature much richer in detail than a GIS database, but both BIM processes and GIS will require network capabilities to share information.



Entire cities can now be captured and taken in to a CAD environment



Bentley 3D models can use geospatial data such as ArcGIS from Esri

Smart cities

It is also important to consider other elements that are affecting this integration. In order to have Smart Cities, it is important that these cities do not exist in isolation. The Internet of Things, Big Data and the Cloud all contribute to an abundance of data. Combining them with BIM processes and geospatial data, a city has the potential to be genuinely smart, but it still relies on the potential of BIM methodologies.

To unlock this potential, integration with geospatial information is critical. If you consider the advancements in technology and the ability to capture infrastructure in 3D with the use of drones and turn them into usable models, then you can imagine the potential when you can overlay intelligent data that has geo-coordination.

The ability to overlay geospatial data into a 3D model gives it rich and intelligent properties that could benefit engineers. In fact, the adoption of a 3D cadastre is not a new concept – it has been delivered on a national scale in Singapore, for example. This integration also requires consistent collaboration among vendors that provide the technology, much like Bentley's applications that interoperate with other vendors, such as Esri's ArcGIS, and offer i-models for the exchange of data throughout the BIM process.

We've seen huge advancements in terms of the format standards created, with IFC as an example of this driving through positive change. This integration between BIM processes and GIS will happen, contributing to smarter cities. But organisations should be careful when venturing into such new territory.

THIS INTEGRATION BETWEEN BIM PROCESSES AND GIS WILL HAPPEN, CONTRIBUTING TO SMARTER CITIES

Aidan Mercer is industry marketing director, utilities and government, at Bentley Systems (www.bentley.com)