

## A Roundtable Discussion

# 3D Intelligent Cities

**3D City modeling and 3D GIS are currently hot topics in the market. We see many vendors approaching this market, while users are trying to justify the benefits and the return on the investments they foresee in creating and managing a 3D City model. At Bentley's BE Inspired thought leader congress in Amsterdam, over 100 participants discussed the state of the technology and the business cases associated with 3D City modeling. The discussion was passionately moderated by Pat McCrory, the Mayor of Charlotte for the past 14 years, capital of North Carolina and the 18th biggest City in the USA with a total population of 750.000 citizens** (*source: [http://en.wikipedia.org/wiki/Charlotte,\\_North\\_Carolina](http://en.wikipedia.org/wiki/Charlotte,_North_Carolina)*).

By Ton de Vries and Sisi Zlatanova



3D Model of Rotterdam

### Introduction to 3D City Models

Mayor McCrory started the discussion with the statement that he would have to spend the money to build and maintain an intelligent model of his city, to better plan, communicate and realize complex infrastructure projects, today. Visionary leaders in government, like Mayor McCrory, are always looking to improve the quality of services, while reducing risks and improving efficiency.

Sisi Zlatanova, co-host of the roundtable discussion and associate professor at the GIS Technology section, Delft University of Technology, the Netherlands and an authority in 3D GIS research and publications, explained to the audience the requirements for creating a sustainable 3D City model. She emphasized the need for semantics (intelligent features) and 3D topology (intelligent geometry) as a basis for building a 3D City model. Pretty pictures alone are not good enough! Furthermore, she explained that integrated 3D modeling is a necessity for above and below ground infrastructures with a strong focus on integrating this into one environment. She also discussed the need for an integrated system architecture allowing a unified information approach.

Bentley's sponsor and Solution Executive for Government, Ton de Vries, finished the introduction by pointing out the increasing need

for governments to do more with less and to reduce the impact of infrastructure project execution while at the same time increasing the speed of renewal and expansion. The world's complex infrastructure, especially in cities, requires a more holistic approach to creating, building and managing this infrastructure. City infrastructure is dense and fragile; changes to the infrastructure can have a huge impact for the citizens, the businesses and the people working on it. Increasing efficiency and quality while decreasing risks starts with a real life view of the current situation. This allows users to do better planning, error free engineering and improved operating decisions for changes to the City infrastructure.

To support these processes Bentley has added support for 3D planning, engineering and operations throughout its products. Point clouds are supported as a native data type allowing 3D survey data to be used directly in MicroStation. Bentley Map is now fully 3D and supports the creation and maintenance of 3D objects with their semantics, geometry and appearance. Oracle Spatial objects can be directly accessed, manipulated and posted by the user-friendly interface of Bentley Map. Descartes provides an integrated environment for easy texture placement based on standard photos of



facades and other city objects. Clash detection in Navigator and MicroStation provides sophisticated functionality for line-of-sight and fresnel analyses. A large variety of 3D spatial analysis can be performed completely with the help of 3D Boolean operations. Users can use the direct connection from MicroStation to enhance their 3D City model with Google 3D Warehouse components or upload their model to the 3D Warehouse. 3D City models can now be exported in the international standard CityGML.

Project Wise Geospatial Server fully leverages Oracle Spatial 11g's 3D and raster support. It also provides and manages the BIM/GIS integration that so many organizations have been looking for, for the past decade. Geo Web Publisher allows mash up streaming of your models to Google Earth and Google Earth browser plug-in, providing seamless integration of your 3D City models into Google. 3D reality needs 3D design, engineering and analyses. If you are integrating and updating an existing infrastructure, and this is quite



3D Model of Helsinki

often the case in Cities, you need to know exactly where you can add or change infrastructure without running into problems. It's about increasing efficiency, improving quality and reducing risks.

### Roundtable Discussion

Several participants indicated that they have seen great technology improvements over the last few years, but it remains difficult to find the funds and resources to start actually building their 3D City model. Creation and use of 3D City models needs to be placed on the city council agenda in order to get the funding and the organizational structure in place. The positive impact of 3D City models on a variety of governmental and organizational work processes is recognized as being huge; better communication internally and externally, lesser design, construction and maintenance errors, even reduced construction impact for citizens and businesses due to the fact that projects can be completed faster, more efficiently and with less risk. Technology alone cannot make the difference. Organizations need to initiate the discussion on building their 3D models. City authorities like the city of Helsinki in Finland, Montreal in Canada and Rotterdam in the Netherlands, have made the 3D City model a priority and are already seeing the benefits. All these cities have one thing in common; they started creating and using a 3D model as part of a project. They had the vision and wanted to convince their management, and they succeeded.

How expensive is it to build and maintain a 3D model? This is a question that can be answered, but as usual, there are a lot of factors that influence the final cost. Most cities start with a partial model, with a relatively low level of detail (level 1 or 2), while upgrading parts of their city to a higher level, level 3 or even level 4, when a major project occurs in that area. This way the city model gradually becomes more extensive and intelligent over time, while keeping the

costs of creating and maintaining the model reasonable. Cities at the roundtable stated that in the end the costs of creating and maintaining a 3D model was less than they expected, while the demand and the use of the model was still growing by the day.

While creating and implementing 3D City models, organizations are looking for standards. They want their city model to be sustainable, based on open standards like CityGML and stored in a Spatial Database. CityGML is increasingly being used as an exchange format but it is much more than that. CityGML is a datamodel with topographic objects represented by their geometrical, topological, semantic and appearance properties. It also provides Levels of Details, which allow users to explicitly define the granularity of their city models. More information on CityGML can be found at: [www.citygmlwiki.org](http://www.citygmlwiki.org).

### Concluding Remarks

Many cities and their eco systems are adopting and others will adopt 3D models rapidly. Many people see the benefit of using 3D models for many applications, such as civil engineering projects, city management and development, plus safety and security. The technology has made great improvements over the last few years and 3D models are becoming more affordable, easy to create and exchange. Once organizations get started with creating and using 3D models, they become enthusiastic, benefits show up and nobody ever wants to go back to a 2D GIS world only.

*Ton de Vries, Solutions Executive Government at Bentley Systems.*

*Sisi Zlatanova, Associate professor Section GIS Technology, OTB, Research Institute for the Built Environment, Delft University of Technology, Delft, the Netherlands.*

*For more information, have a look at: [http://communities.bentley.com/solutions/government/3d\\_models\\_for\\_intelligent\\_cities/default.aspx](http://communities.bentley.com/solutions/government/3d_models_for_intelligent_cities/default.aspx)*



London Subway in 3D