HELSINKI – A ROLE MODEL FOR OTHER CITIES

HELSINKI'S USE OF 3D VISUALISATION TECHNOLOGIES HAS TURNED IT INTO A SMART CITY – AND HELPED TO ENGAGE CITIZENS. AIDAN MERCER REPORTS

A smart city is a visionary statement for urban development that aims to converge data by adopting new and exciting technologies to better manage a city's assets, improve services and ultimately improve the quality of life for all. The smart city concept is not new. Yet, it does seem to be making a resurgent comeback as the topic is being systematically addressed once again. As rapid urban expansion threatens to put further strain on the physical infrastructure and the assets that comprise a city and the demand for improved city services increases, the caveat to it all is that budgets are diminishing. This dichotomy is the crux of smart cities: to deliver new assets, streamline processes, improve services, provide better value, make data publicly available, improve public perception, adopt innovative technologies – all at a reduced cost.

One approach to achieving a smart city is to have a strategy for 'going digital' – that is, to digitise processes and systems across the variety of disciplines to have a greater breadth of communication with other digital systems. For some organisations, this digital journey has begun, and the strategy for delivering against smart city goals is well under way.

Going digital is a phrase that will resonate with both the AEC industry and asset owners in 2017, as a heightened level of focus is placed on engineering as the means to deliver this promised strategy. The enablement of a digital strategy is being realised as infrastructure professionals can take advantage of software that has, for example, a Microsoft Azure-provisioned connected data environment that digitally connects and converges people, processes, data and technology to yield significant results.

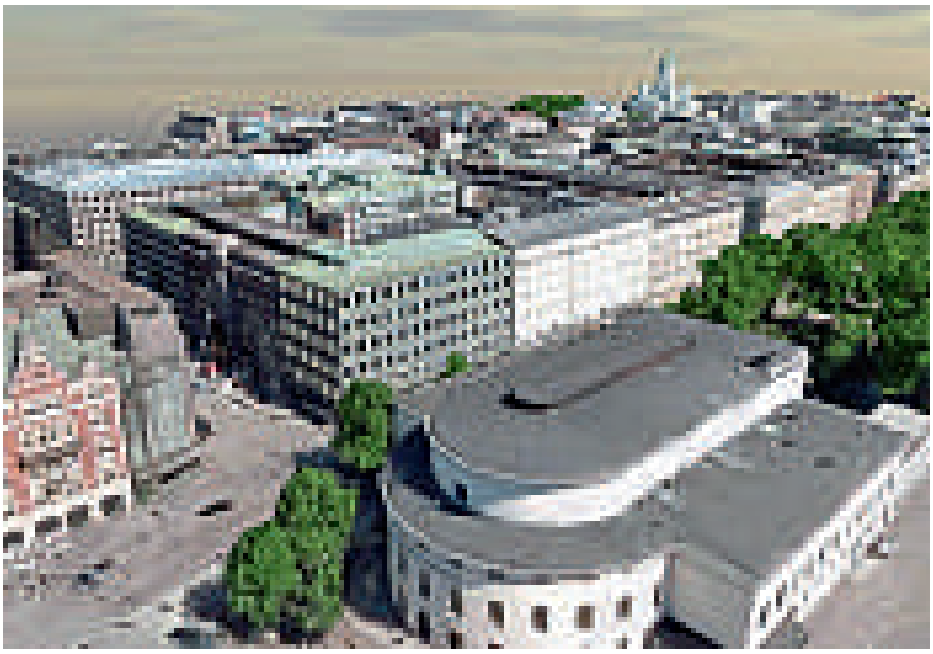
The transformation will have a profound effect on the realisation of a smart city – a term that has yet to achieve its full potential. The burgeoning use of digital engineering models, the models created by engineers, will act as visual operations and connected infrastructure asset performance as they take advantage of cloud computing, the industrial Internet of Things, Big Data and operational data from a variety of sources. These models will be referenced through the full lifecycle of a project, adding longevity and performance improvements as a result.

At Bentley Systems, we are seeing a great take up of new and exciting technologies. The proliferation of reality modelling – the process of capturing existing site conditions with the use of digital photographs or point-cloud data – across infrastructure project delivery and asset performance is now widely adopted. Reality modelling is increasingly used to capture larger environments, such as entire cities or sections. Reality modelling provides a context and capture methodology is enabling cities to become smart, primarily because the reality meshes that are generated are engineering-ready and therefore critical in a variety of workflows for infrastructure professionals in project delivery, or asset performance.

Everyone wants to be smart

Many cities are indicating a desire to be smart. Yet, given the understandable complexities involved, it is no surprise that some do not find the rapid results they expect. There is no easy definition of what a smart city is and the whole notion provides a plethora of complexities.

As technology continues to advance, with a digital revolution that is enabling a new potential by providing more data and connectivity that ever before, some software users are taking this unique opportunity of finding new and innovative ways of not only meeting goals, but also surpassing them. One such innovator is the City of Helsinki. Its



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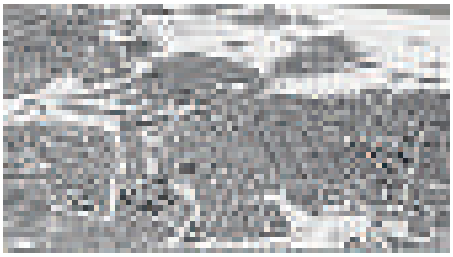
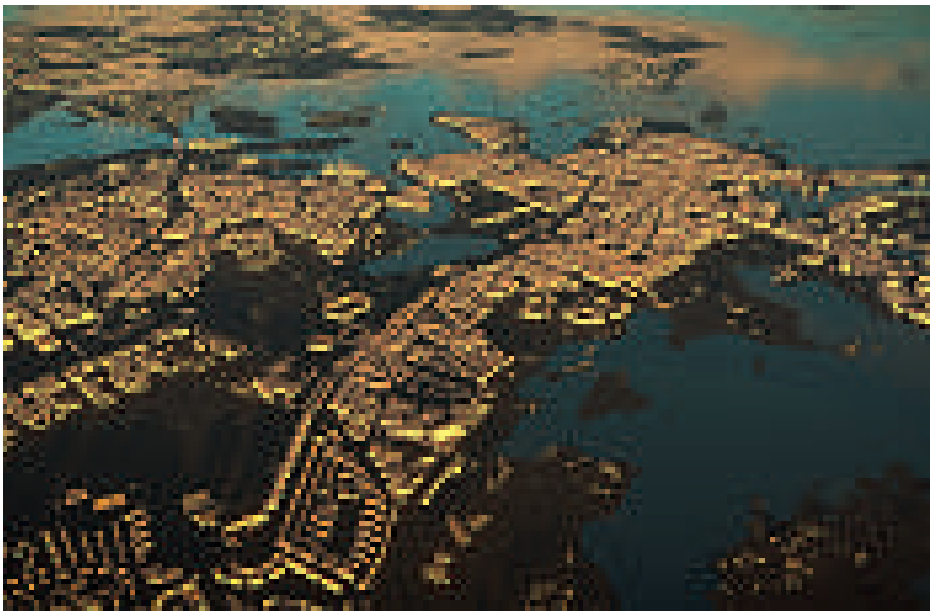
The City of Helsinki's reality model



The City of Helsinki created two city models

A city scale wireframe mesh



The City of Helsinki integrated CityGML models

The reality model is accurate down to the street level

The City of Helsinki used this reality mesh for 12 pilot projects

'Helsinki 3D+' project, the winner of a Bentley Be Inspired Award in 2016 for Innovation in Reality Modelling, is leading the way for smart reality capture and consumption and is the shining light for others to follow.

Helsinki is leading the way

For Helsinki, however, its 3D city accomplishments have been as a result of many years of dedication and to the potential of 3D. Since the 1980s, Helsinki has been developing 3D strategies for urban planning, and Bentley is very proud to have worked alongside them on many initiatives over the years as a technology provider and partner. The evolution of their smart city initiatives has ranged from geospatial information modelling, cadastral mapping and even 3D City GIS. Today, this evolution has allowed Helsinki to create two city models – one intelligent CityGML model it calls its city information model and the other is a reality mesh created using Bentley's ContextCapture.

The CityGML model is fully textured, LOD2, which allows it to integrate and syndicate linked data with large-scale, existing applications and showcase the benefits throughout the lifecycle of any given project. This 3D semantic model is a national spatial data infrastructure (SDI) that provides accuracy and acts as a platform for analyses, ranging from solar potential to energy building consumption in which the applicability of the roof and wall surfaces of all Helsinki's buildings for solar energy production is being studied.

Both models follow a similar production line, but provide different outputs. For the CityGML model, the raw data is derived from point clouds, IFC/Inframodel BIM data, GIS databases, obliques, registers and new geodata inputs such as sensors and IoT devices and smartphone data is soon to be adding as inputs to the model. This provides rich data for actionable decision making and for all their urban analysis and planning purposes and essentially allows a spawning of two types of models to be created.

The second model was done over a much shorter period and was created in under three months from the initial capture to the process. Helsinki recently launched an initiative to produce a 3D representation of the city to a photo-realistic mesh that could be used as a context to the CityGML model. It used a combination of laser-scanning and oblique photogrammetry as the data for the creation of the model. Leveraging ContextCapture and a host of Bentley 3D reality modelling applications, the team modelled the surface and terrain, and generated a 3D engineering-ready reality mesh of the entire city, using 50,000 oblique images, which equated to 11TB of data that needed processing.

The result is a stunning, photo-realistic reality mesh of the entire city, which is used as an immersive environment for visual operations. The team used more than 600 ground control points during capture to ensure the data had a positional awareness – as a result, the ground-pixel accuracy is 10cm, and the overall accuracy of the model is 20cm±10cm. The entire map of the city is also geocoordinated and knows the location of each asset or building.

Perhaps most importantly, the city of Helsinki is enlisting the help of outside partners to the benefits of the 3D models are far reaching. They are also providing the data as an open format – that means the city is providing the models to citizens, officials and private companies for free use and commercial development. The open 3D data is available as a web service and allows for queries, analytics and development of new projects. As part of their new workflow, the models are also being developed with many universities. This provides innovation hubs and

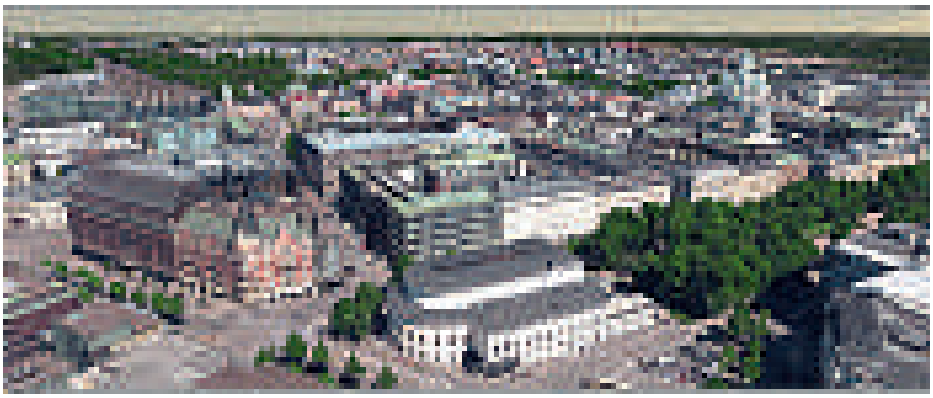
cooperation units that help to develop the two models beyond their intended use.

Making data open and available

This 3D reality mesh was made available for the public last December in an open format for anyone to view and access. But rather than just being a visually compelling medium, the reality mesh has far greater use as it can also reference other geospatial data sources. By connecting other data sources to this model, Helsinki has made this model even more intelligent.

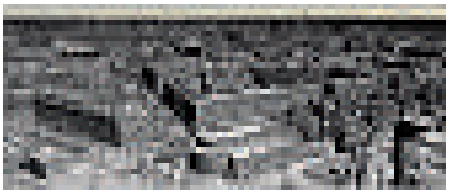
As a result, the city is currently working on no fewer than 12 pilot projects. One highlight is a City GML/Inframodel/IFC collaboration that acts as a five-dimensional project management tool for city development. In other words, it adds the dimensions of time and cost to 3D design information. As development projects continue to increase to cater for a larger urban dwelling in Helsinki, the timing is perfect. The city has also used the 3D models to develop a Minecraft Helsinki, 3D virtual parks, a system for modelling maintenance processes, and better urban analytics including tools for quality indicators for urban space, CO_2/GHG/Emission analysis and solar potential analyses. And it looks like there might be even more projects coming in the future.

Helsinki 3D+ is also working on a citizen interaction platform for city planning as a result of the open format. Using this platform, citizens of Helsinki can have a direct say in whether they want more or less car parking, or more parks, for example. They can also vote on issues that directly impact them as citizens – such as high-rise buildings that might obstruct views. Because they are well communicated with, they have a sense of involvement in public infrastructure. This data is passed to the Helsinki city planning employees, who incorporate it into their design processes.



ContextCapture delivered a high-quality reality mesh for the City of Helsinki

Furthermore, in cooperation with the Technical University of Munich in Germany, Helsinki is refining its energy analysis methods to meet some very ambitious energy consumption goals. Helsinki aims to be carbon-neutral by 2050 and greatly reduce its dependence on fossil fuels. It also plans on adding IoT (the Internet of Things) to this model to add real-time, operational data to the model to enhance asset performance for public services.

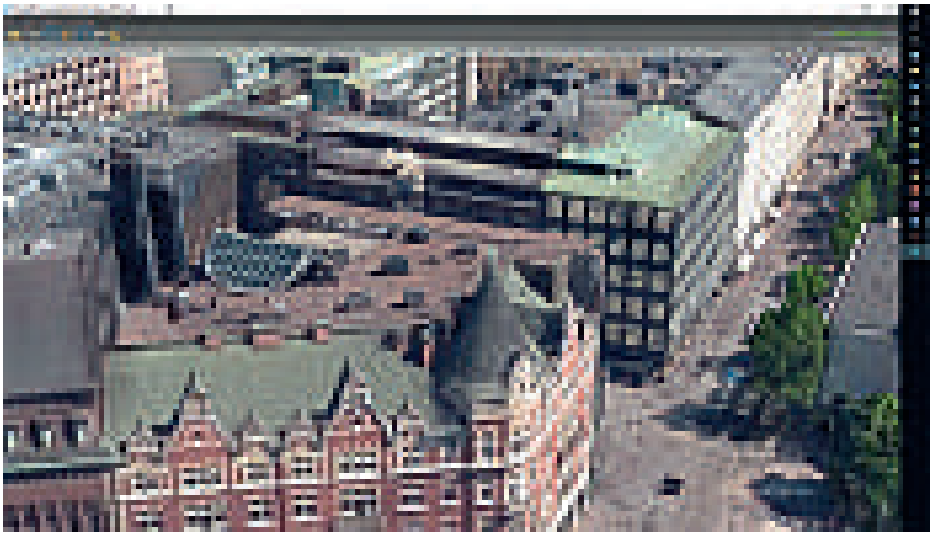


A pre-mesh model

Can you compare cities that want to be smart?

A direct comparison between government organizations in relation to progress for smart cities is not necessarily an easy notion, given

Photographs and laser scanning data created a reality mesh for Helsinki



Digital cities are now a reality

The City of Helsinki has been using in 3D technology since the 1980s

differences in data, language, processes, people and technology. Each government entity has different working conditions and goals as set out by internal bodies and stakeholders. For example, the specific smart goal of one government may differ to another, and the measurement and findings will dictate projects and pilots as a result.

Finding commonality is easier. For example, most governments want a '3D City' as a visual representation of the environment. This allows for immersion, decision making and communication via a realistic context. With the rise in digital natives and a burgeoning millennial workforce, these digital means of representation are fast-becoming the norm. By embracing technologies to ensure a going digital strategy, the differences between government agencies is becoming less apparent.

It's hard to look beyond Helsinki as the example for urban planning and engineering though. As governments and organisations endeavour to be 'smart', collaboration with other agencies that have tried-and-tested methodologies could provide significant benefits to all parties. Sharing 'do's and don'ts' is critical to ensuring public investment is used wisely. Helsinki is once again a good example of a government finding methods to capture and process at a cheaper cost with photo realistic results.

Jarmo Suomisto, architect, project manager, Helsinki 3D+, says, "The advanced capabilities inherent in Bentley applications facilitated our ability to promote smart city development and improve our internal services. Using this innovative technology allowed us to create innovative city models and make well-grounded decisions."

This capture and consumption opportunity, if we can call it that, is making the opportunity for smart cities truly available today. But let's not forget that smart cities do not live in isolation. The need for interaction with their own systems, data and people is obvious. By going digital, and improving collaboration with outside agencies and services, other cities can meet their smart goals sooner than we might imagine ensuring public investment is not only transparent, but provides real value and services to its citizens.

SMART CITIES DO NOT LIVE IN ISOLATION

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