



Project Summary

Organization
City of Helsinki

Solution
Government

Location
Helsinki, Finland

Project Objectives

- Ensure an integrated approach to city-wide planning that is both intelligent and aesthetic
- Improve communication and discussion with residents
- Speed up the design and approval of city planning proposals

Products Used

Bentley Descartes,
MicroStation, ProjectWise

Fast Facts

- City of Helsinki is developing a 3D digital model of the entire city
- The 3D city model is the basis for all design and building permit workflows
- With more than 500 users, the city is an enterprise-level user of Bentley's MicroStation

City of Helsinki 3D City Model Supports Master Plan

Bentley's 3D Products Underpin Citywide Planning, Clear Communication, and Fast Decision-Making For Development Projects

City Relies on GIS Technology for Planning

Good design has been underpinning development policy at the City of Helsinki since the first city plan produced the renowned neo-classical city centre in the early 1800s. Many talented architects have since been involved in planning Helsinki, and in recent years GIS technology provided by Bentley Systems has proved to be an invaluable tool.

Digital mapping of the city began in 1982, and the first 3D digital model of an area of the city was created as part of an architectural competition in 1987. Maintained by a small team within the City Surveying Department, the city's 3D model has been evolving ever since. The DGN-based model is built at a scale of 1:500 and now encompasses all of the local terrain and 45,000 buildings, half of which are fully represented by rooflines and facades.

Helsinki is on target to realize a fully detailed 3D model for the whole city by 2013. This could not be achieved without Bentley's MicroStation®. There are more than 500 MicroStation users in 18 organizations within the City of Helsinki, which has a Bentley Enterprise License Subscription for Municipalities. One of the first to sign up for this type of agreement with Bentley, the City of Helsinki gains unrestricted access to a comprehensive portfolio of software, all for a set annual fee based on population size.

The software portfolio includes Bentley® Descartes, an imaging product for working with scanned drawings and records that's integrated with MicroStation to provide high productivity, visualization, mapping, and raster-to-vector conversion. MicroStation was used by the city to create a sea level protection map. It also supports ground modeling and feature extraction from point clouds in conjunction with Terrasolid software, which is used for airborne and mobile LIDAR data and image processing. In addition to mapping above-ground assets, the city has laser-scanned extensive tunnels and underground spaces as it prepares an integrated plan that anticipates the city's future needs.

Citywide Mapping

The coastline and numerous islands that lie within the city boundary pose a particular challenge, and the complicated

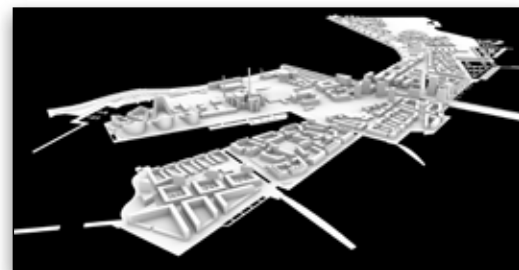
nature of the local terrain has resulted in a modeling project that is both extensive and comprehensive. The process of collecting details has taken years, with some data coming from original drawings and more recent data being taken from surveys using laser scanning technology. Laser scanning now covers one-third of the city each year, so the raw data is never more than three years old.

The City Surveying Department gathers data and creates basic maps and models. These are passed to the City Planning Department and its 90 architects, who use MicroStation to start the design process. Sections of the model begin as outline 2D sketches, and then blocks are placed over the map. It is a simple process to elevate them with Bentley's smart editing tools for 3D objects.

The citywide surveying and planning project is one of the biggest undertakings by the City Planning Department, according to Jarmo Suomisto, an architect who now acts as IT manager in charge of workflows within City Planning and has overall responsibility for the Helsinki Master Plan. Suomisto said the use of MicroStation throughout the organization has helped to revise and refine the department's myriad processes to establish and implement streamlined workflows.

Intelligent Planning

It is now possible to model a significant development area within just half a day. This provides an almost instant opportunity to visualize individual urban spaces and how they might connect with each other. Suomisto reported that it is extremely useful to be able to get to 3D very fast then add



3D project model of the Kalasatamanranta area of the City of Helsinki.

“The future holds a smart 3D model that contains analytical information as well as geometries. MicroStation gives us extensive visualization tools, and we anticipate that we will continue to develop these and add new ones.”

– Jarmo Suomisto,
IT Manager, City Planning
Department, City of Helsinki

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more detail later, rather than sketch in 2D and move to 3D only to discover unforeseen problems six months down the line. Geographic coverage has so far been dictated by need; when a large development project is under discussion, a specific local area is modeled in detail.

The process of designing, revising, and approving a city planning proposal typically takes two to three years and involves the storage of many documents. The Oracle planning database is so large that it is broken down into separate entities and managed using ProjectWise®, Bentley's project team collaboration software, which the city uses across several departments.

With ProjectWise, emails and documents that previously resided in different areas of the system are now kept together in a central location, so that data is accessible, consistent, and reliable. Users only need to check one location in order to find data associated with a specific project, and they can easily share data so that anyone can see preliminary sketches. In addition to managing documents and pictures, ProjectWise creates yearly project action plans for more than 300 annual projects.

According to Suomisto, this openness allows everyone to learn from each other and improve their project, planning and modeling skills.

Accurate Spatial Analysis

Precision is vital if the impact of new buildings is to be assessed. With the Bentley products, users can achieve accuracies of less than one meter, with error margins of 10-15 cm in detailed modeling. This enables professionals in other disciplines to understand the possible consequences of proposed developments such as the threat of rising water levels in low-lying areas or critical vistas and visual corridors. Thus, more information can be requested and problems resolved at an early stage, leading to better-informed decisions, fewer planning appeals, and reduced revision costs.

As an example, Suomisto cited the proposal for a particularly high bridge. Planners had to assess the visual impact of the bridge, and they needed to know from how far away the structure would be visible. The bridge was quickly modeled with lights placed at the top, and then a calculation was done to highlight all the areas of the city from which the lights would be seen. This simple operation, which took just a few hours, would have taken weeks using on-site surveying techniques.

Efficient Regulatory Processes

In Helsinki all building construction requires a permit, and each permit request has to be supported by a detailed plan of the city based on the 3D model. It is clear that the 3D city model may well have a future role in the regulatory review process. Time would be saved during the investigation of a proposed building project by linking to the 3D model, incorporating existing data into discussions, and removing the need for costly resurveying. Suomisto expects that 3D models will become a mandatory way of producing legal documents in the near future.

Helsinki Energy, responsible for district heating infrastructure, now references the 3D city model data when it plans its networks. In addition, communications service providers in Helsinki also reference the 3D city model when planning upgrades and extensions to their networks.

Clear Public Communication

During public consultations, all communication with residents features the city model. Every plan is usually presented at least two times, and each time it becomes more detailed. Suomisto noted that to the layperson, a 3D model is much easier to understand than a 2D architectural drawing. As a result, there is faster feedback from a greater number of people.

For city planners, this means approvals can be granted much more quickly than before. For example, a process that used to take two and a half years may now be completed within one and a half years. That represents a huge cost savings, because an office or retail development can be generating income and local taxes up to one year earlier.

The 3D city model is also improving transparency as the basic models and renderings for all proposed and approved developments are available on the City of Helsinki website. The 3D models have been plotted out for presentation to the public both in Helsinki and overseas.

Lifecycle Infrastructure Management

Helsinki is entering the biggest construction boom in the city's history, following the move of a former cargo port away from a central site to a newly built harbor in eastern Helsinki. At the same time, the city is reserving certain underground areas for infrastructure such as metro and rail stations, a district heating and cooling cogeneration plant, car parks, and goods handling facilities. Planning plays a crucial role as Helsinki redefines its future, and MicroStation is poised to support the cost-efficient lifecycle management of critical infrastructure.

“It is very important in planning to understand the space between buildings, and the current 3D model is all about the shape of our city as we grow above and below ground,” Suomisto said. “The future holds a smart 3D model that contains analytical information as well as geometries. MicroStation gives us extensive visualization tools, and we anticipate that we will continue to develop these and add new ones.”



Detailed 3D rendering of a new development in the Kruunuvuori area of the City of Helsinki.