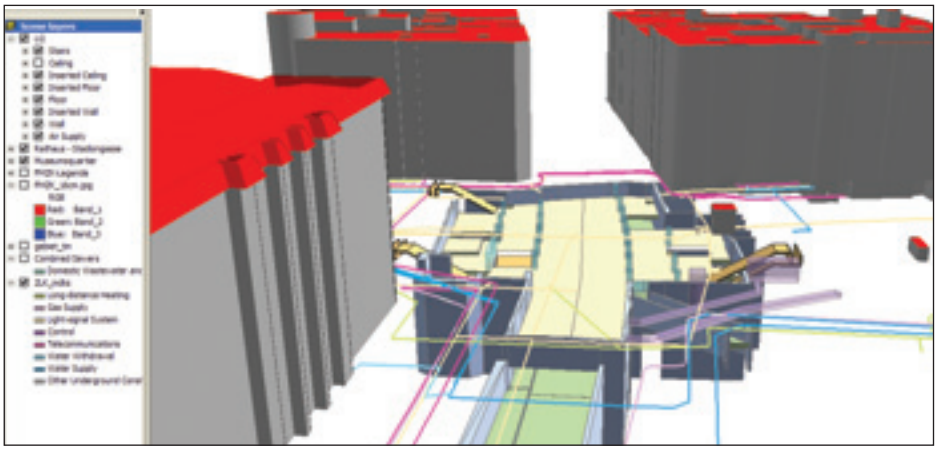
A VALUABLE TOOL FOR COMPLEX PLANNING ISSUES

Draft master plans can be an intimidating, especially to non-technical audiences, and can actually generate conflict through misunderstanding. A 3D model, with its intuitive representation of the environment (we all see the world in 3D!) improves the quality of debate, option appraisal and accelerates decision-making.
For the re-development of an entire Vienna district, the City and investors required the evaluation of a master plan within the wider city context, and determination of the content, structure and permitted building height of each element. 3D data of the neighbouring districts was merged with proposed plans. Using standard tools (3DS/CAD) the draft master plan was visualised quickly at LoD1 within the surrounding city. The process facilitated a review of the options and informed discussions with stakeholders, including local residents. One particular challenge of this development (in red) was to avoid any visual impact on Belvedere castle (blue arrow). Line-of-Sight analysis of each option was run against the model.

INTEGRATING BELOW GROUND DATA

3D SUBWAY INTEGRATED INTO GIS



By applying structured 3D modelling principles to bridges, subways and other subterranean objects this data can be incorporated into the digital city. The advantages of being able to analyse data both above and below ground is clear (and a current hot topic in the UK with the UK Government's Traffic Management Act (TMA)[1] and the EToN[2]). CityGRID is being used by the City of Vienna to embedded the municipal supply lines into their cadastre using ArcGIS/ArcScene (figure above)

Reference:
[1]*www.dft.gov.uk/pgr/roads/tpm/tmaportal/*
[2]*www.dft.gov.uk/pgr/roads/network/local/streetworks/cop/pdfelectronictransnotices.pdf*

3D DATA SOURCE

3D CITY MODEL OF VIENNA SCHOENBRUNN CASTLE, COMBINED WITH TERRESTRIAL LIDAR DATA FOR REPRESENTATION OF TREES

Whilst photogrammetric processes output 3D lines and are therefore optimised for generating 3d models, it is perfectly possible, to use a vast array of new and existing data capture methods. These include: 2D plans, archive data, topographic surveys, photographs, terrestrial and airborne laser scan data (LiDAR) and aerial photography.
For example from LiDAR, structured roof lines can now be generated (semi-)automatically and imported into a model. This can be supplemented with terrestrial scan data to show trees and street furniture making the 3D simulation of urban areas more vivid as shown in the example of Vienna's Schoenbrunn castle above.

3D MODELS IN ARCHITECTURAL COMPETITIONS

ARCHITECTURAL COMPETITION FOR PROPOSED NEW CAMPUS SITE IN LOWER AUSTRIA, TREES FROM LIDAR DATA.

After finalising and agreeing draft planning investors frequently commission an architectural competition to choose the optimum project solution and again the 3D model provides significant benefits to this process. Architects prepare the design options in 3D, and this is integrated into the city model so the impacts of any proposals are clearly identified.

Q&A WITH MET GEO

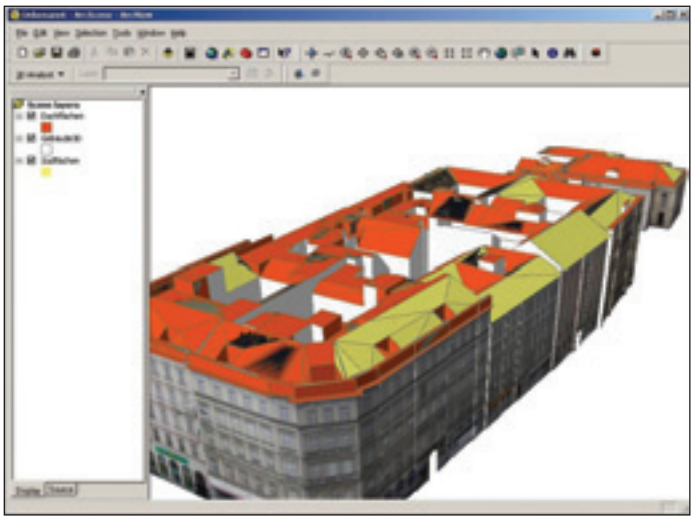
STEPHEN RIXON CONTRIBUTED TO THIS THIRD EDITION OF THE GEOLYMPICS SERIES WITH HIS THINKING INTO HOW CITIES IN MAINLAND EU ARE UTILISING 3D DIGITAL DATA TO OPTIMISE THE PLANNING PROCESS FOR SUSTAINABLE URBAN REGENERATION AND DEVELOPMENT. BELOW HE DRILLS DOWN MORE INTO THE SUBJECT.

Stephen Rixon is Managing Director of Met Geo Info GmbH / Ltd with 25 years of international experience in the geomatics industry. He is a member of the RICS Geomatics Professional Group board and actively lobbies government through the RICS Mapping & Positioning Practice Panel

Q: Can 3D digital data optimise the planning process?
A: Population growth, higher living standards and demographic change are altering our environment into an increasingly urban one. In Europe 4 out of every 5 citizens now live in what can be described as an urban environment. This inward migration creates a number of challenges including competition for land (balancing urban sprawl with conservation), improving energy efficiency, and providing social stability (reducing urban poverty and crime).
Planners are faced with increasing demands to deliver sustainable urban regeneration that in the findings of the Bruntland Commission "meets the needs of the present without compromising the ability of future generations to meet their own needs". For more than 10 years CityGRID has been used to support and improve the quality of the municipal planning process for sustainable development by producing 3D digital environments (or 'digital cities') for several of Europe's largest cities.

Q: What are the benefits?
A: By providing a single coherent data set, fully integrated with municipal GIS, digital cities play a key role in delivering local plans. There are a number of proven benefits:

- Preparation of development schemes: showing clearly what developments will look like, how they fit into existing urban contexts, and efficiently managing design options and changes early in the process.
- Evaluation of planning proposals: aiding policy and planning units to evaluate the impact of developments, not just the financial cost-benefit perspective but the whole picture en-route to developing sustainable communities, including environmental impact, noise propagation, welfare, energy efficiency, air quality and waste.
- Communication: engage with the public in interactive and intuitive ways; evidence shows that urban regeneration is far more successful with meaningful community involvement. Acceptance is higher and typically supported with publicly generated innovative ideas.
- Compliance and enforcement: to monitor compliance with planning conditions and provide evidence for enforcement action when necessary.
- Marketing: to promote the city and attract inward investment.
- Collaboration: efficiently supporting all stakeholders (investors, architects, design and construction partners) who share access to a definitive data set. GIS integration also enables access to multiple users providing further cost sharing with other disciplines including noise modelling, environnemental protection, flood prevention, emergency services, homeland security and traffic and master planning.



3D-Visualisation using ArcScene showing selected roof areas suitable for solar panels

Q: What are the limits of the "off-the-shelf" 3D data set?
A: Large commercially available "off-the-shelf" 3D datasets can be impressive, with a realistic feel, but typically lack the data structure to support any secondary application. By their nature they are optimised for visualisation and not analysis. Unstructured data carries an additional burden in terms of maintenance overheads, which tends to make these types of models 'snapshots in time' of the urban environment. Keeping them up to date is a considerable challenge.
In contrast CityGRID uses a 3D line-structure to store building

3D SIMULATION TO IMPROVE PUBLIC RELATIONS

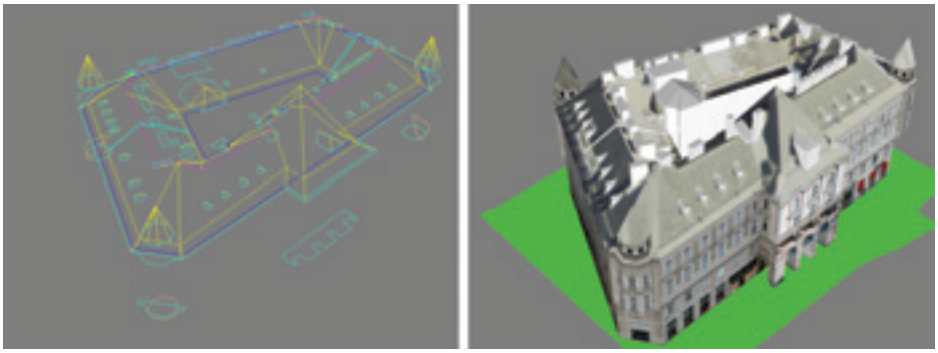
Planned shopping centre in the centre of Klagenfurt

Existing situation before construction

Digital modelling is increasingly being used to gain acceptance of potentially controversial projects. These projects are benefiting from the integration of the existing environment and the proposed plans into a 3D simulation. Models of neighbouring buildings are made visually realistic using photographic texturising of the façades. This provides an immediately recognisable scene that residents can relate to and understand the impact of the proposed changes. A significant level of opposition can be attributed to misrepresentation of the design. 3D models, as an intuitive medium, greatly enhances the value of the consultation process (with good ideas being generated, public consultation meetings can become a positive process) and can produce resolutions faster. These 3D simulations are further improved by using realistic shadowing and lighting simulation, resulting in better quality of planning, consultation and reduction of errors during construction.

With the ever increasing move from analogue to digital and the need to maximise returns on infrastructure development and re-generation 3D structured digital models have great potential to help meet business requirements spanning many service areas.

Noise Protection: 3D model providing information on windows adjacent to the proposed highway noise barrier



Structured and detailed roof data (left) into LOD3 3D digital cities c/w realistic façade and texture detailing (right) GIS Integration. 3D-Visualisation using ArcScene showing selected roof areas suitable for solar panels

information as opposed to faces. This provides the ability to maintain a city scale model using database type procedures (i.e. en-mass and homogeneously). As soon as 'maintenance' becomes a topic for users, as it is with the design, planning, construction and O&M cycles, they will require a longer-term perspective and integrated tool-set that can support it. There will almost inevitably be a need to integrate with existing GIS base layers (i.e. cadastral). For that reason, CityGRID provides powerful re-structuring algorithms enabling highly automated transformations of the line structure.

Thus for project simulation and long term management of extremely large city models, and to enable efficient data integration from numerous sources, all data in the digital city must be stored, managed and accessed via a database.

Although visualisation models are without question useful, and cost effective to produce, they are limited by their static nature. By contrast the structured managed digital city becomes an interactive dynamic representation of the real world.

Q: What can be done to maximise the use of digital city?

A: To maximise the utilisation of the digital city, robust inter-operability is critical. For example, robust GIS compatibility relies on the model being logically structured: each building requires unique referencing. In CityGRID this reference is persistent enabling maintenance of the linkage between attribute data and different resolutions of modelling, commonly known as Level of Detail (LoD). A building within a digital city needs to be represented at different LoD for different applications. Working with a structured data set, it is possible to use the same base-data reducing redundancy and the potential for inconsistency inherent in maintaining multiple versions of a data set. This has several key benefits:

- rapid simulation and change management of vast urban models.
- simple integration with existing data.
- Simple block models (LoD1) can be improved by adding detail as required. Textures can be applied at any LoD.
- Intuitive, powerful tools for visualisation, web-delivery, interactive rework and automated import/export of numerous data standards and formats including the OGC standard, CityGML.