

SMART THINKING FOR SMART CITIES

3D VISUALISATION TECHNOLOGIES WILL BE NEEDED IF WE ARE TO ENVISAGE THE SMART CITIES OF THE FUTURE, SAYS JOHN STOKOE

Cities are starting to get smarter with data sources and multiple sensors connecting people, services and things so they can engage with each other. Bringing together infrastructure, social capital and technology fuels sustainable economic and social development with the aim of providing better lives and urban environments for all.

Cities must innovate fast and smart to deal with the major urban challenges of population growth (or decline in some cities), housing, healthcare, energy, education, transport, finances, security, economic development, and leisure. History has shown that balancing these needs and wants of cities and their citizens is complex and fraught with political and financial minefields.

If aeroplanes were built and operated like cities, no one would fly in them. Now cities are deploying technology from aerospace and other highly efficient industries including F1 motor racing, in a drive to improve services, promote universal access to information and accurately envision future performance.

Advancing cities into an age of smartness requires a paradigm that delivers new vision. This can be enabled by the creation of virtual twins of cities in the digital world. These highly visual, interactive and dynamic 3D models evolve with the city and grow as more information, knowledge and data is added. They can then be used as a central reference point for local government, urban planners, architects and citizens to view their city accurately, based on current information which is unified into a single source of the truth.

With this approach, progressive cities can commit their work, including 3D digital models of existing and proposed buildings and services, to a unified platform building up an increasingly detailed

model of the city when new projects and live data are added. As more users contribute information a 'time machine' historic model emerges. This allows historic situations to become viewable helping to avoid past mistakes while the progress of current work can be very accurately monitored, recorded and tracked. In short, this 3D platform approach allows city authorities to manage the past, sustain the present and plan the future, enabling legacy to exist sensitively alongside the new.

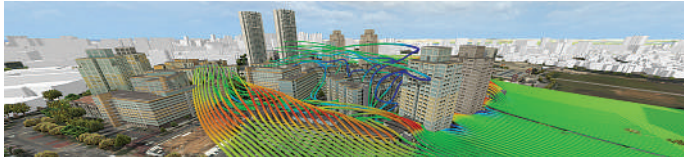
3D city models can be built up from a number of sources including LiDAR. The Dassault Systèmes 3DEXPERIENCE platform converts LiDAR and data from other sources and devices into a single 3D digital model that can be viewed, edited and collaborated on using any viewing platform either on premise or cloud hosted. The platform acts as a central repository for all building and city data, workflows, images, live feeds and 3D building models, as well as data from detectors, cameras, and the Internet of Things. These sources combine into an intelligent 3D model that is used in a variety of applications by professionals and the public at all levels of expertise.

What if?

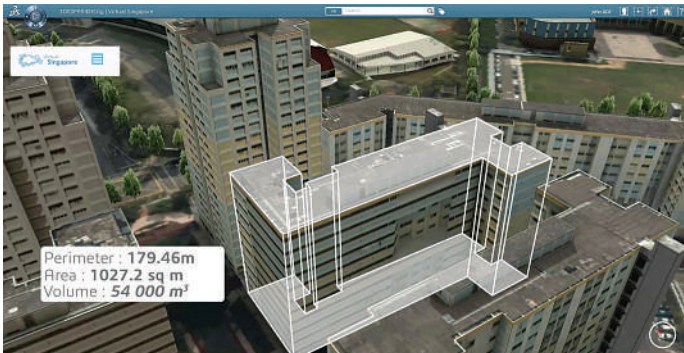
Interactive, data-rich 3D models can also help define the future of cities based on 'what if' scenarios that the technology simulates. These can cover any of the millions of actions and interactions of things and people that comprise the city. Data can be marshalled to create vision for policies and provision of health services, mobility, security planning and energy delivery when the mass of data from sensors and city activities is combined into a single unified platform.



A WebGL rendering of Rennes, France



Wind simulation in Singapore © Dassault Systèmes – Virtual Singapore



Simulating the life of cities and their services using this technology means they can become de-compartmentalised and considered as whole inter-related entities.

This new perspective integrates formerly disparate departments making them better informed, more efficient and able to visualise and simulate with great accuracy to deliver better lives for urban populations. When the city model is cloud-hosted, stakeholders can not only share data between themselves but also be assured that they are accessing the most up to date version, rather than find that they are working on an outdated copy that has been stored in a silo.

Without this accurate vision and unified workflows that record actions and decisions, good planning can be compromised because of 'invisible data' – ie data that is locked away in departmental silos. Adding all data to the model enables universal and democratic access to current and historical information.

Experience the detail

Using shared 3D experiences to simulate cities reveals potential problems that may not be seen by any other means. Overlaying data reveals new views and it is possible, with this technology, to actually predict events in transport systems, and hubs, public services, utility provision and security. Seamlessly linking the system to financial software allows cost planning and budgetary predictability. By this means potential problems and their outcomes can be observed, costed and fixed before they occur.

Building up information and knowledge this way helps make complexity visible and more understandable. That saves time and allows projects to proceed more easily with all stakeholders being aware of the consequence of their decisions. Being able to simultaneously see the big and the small picture with detailed financial implications can also help reduce corruption by making it easier to spot.

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PIONEERING VIRTUAL SINGAPORE PROJECT

Dassault Systèmes has announced a cooperation with the National Research Foundation, Prime Minister's Office, Singapore, to develop Virtual Singapore, an integrated 3D model infused with static and dynamic city data and information.

The collaborative platform will be used by Singapore's citizens, businesses, government and research community to develop tools and services that address the complex challenges the city faces. This project will build on Dassault Systèmes 3DEXPERIENCE City to connect all stakeholders in a secured and controlled environment. Employing data analytics and model simulations, it will be used for testing concepts and services, planning, decision-making, researching technologies and generating community collaboration.

With images and data collected from geometric, geospatial and topology agencies, as well as legacy and real-time data such as demographics, movement or climate, Virtual Singapore users will be able to create rich visual models and large-scale simulations. These can explore the impact of urbanisation on the city-state and develop solutions that optimise logistics, governance and operations related to environmental and disaster management, infrastructure, homeland security or community services.

Powered by the 3DEXPERIENCE platform, it provides a scalable, single unified hub to represent, extend and improve the real world addressing architecture, infrastructure, planning, resources and inhabitants through virtualisation, simulation and collaboration capabilities.

Virtual Singapore was launched as part of Singapore's Smart Nation drive and is expected to be completed by 2018.

Risky business

Many building projects overrun, outspend their budgets by more than 20% and end in expensive and wasteful litigation. Between concept and delivery of a finished building lie the stages of design and engineering, contracts, bids and awards, fabrication and construction. Each stage is fraught with risk.

Stakeholders risk in a building project of any kind can be more than financial. Buildings define their locations and neighbourhoods; people have emotional attachments to them.

Much of this risk can be reduced when clients, architects, contractors, communities and stakeholders work interdependently on the same current unified knowledge platform where guesswork and misinterpretation are removed, and open yet secure collaborative integration is a given.

Better moves

The next logical step for cities that seek to achieve smartness is for the enterprises that construct them to deploy technology that reduces fragmentation, unifies documentation and safely speeds up design and construction.

This change can be achieved by introducing concurrent, flexible and collaborative working methods that turn city data into accessible knowledge. That delivers better operational efficiency and financial returns for investors and stakeholders while

enabling enhanced economic and social benefits for everyone. Smart cities are getting smarter but unless they operate on a single shared data platform they will never be all that smart.

Big picture

Cities need to be viewed and planned as living entities, where every element and every citizen is part of a whole. Changes – no matter how small – cannot be made without examining their impact on the entire organism and its environment.

Studies of the interaction between people and systems have revealed patterns that are anything but standard. If we analyse the patterns and interactions between people and systems – such as transport and waste management – we can develop cities that are still robust while also being highly efficient and sustainable.

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