WHERE TECHNOLOGY MEETS COMMUNITY

URBAN DIGITAL TWINS ARE ALREADY TRANSFORMING CITIES, BUT R&D, STANDARDS AND COMMUNITY INVOLVEMENT WILL ALL BE NEEDED TO EXPLOIT THEIR TRUE POTENTIAL, ARGUES **SIMON CHESTER**

Urban areas across the globe are facing enormous challenges. Population growth is increasing demand for energy, transport, housing and other infrastructure while new technologies – from autonomous transport to the Internet of Things and indoor location – are providing solutions along with whole new challenges. Governments are looking for efficient, sustainable ways to meet the needs of residents.

Smart Cities is a catch-all term that paints a vision of a connected, digital city as a solution to these problems. A core requirement for making a city 'smart' is creating a representative digital environment within which some combination of advanced visualisation, analysis, planning, modelling, simulation, monitoring and citizen engagement can occur: the 'urban digital twin'.

Urban digital twins include static point-in-time 3D models of a city's physical objects in tandem with dynamic predictive models driven by real-time inputs from city-wide sensors. More than just a tool for city managers, well-designed urban digital twins create a diverse, interoperable, accessible, inclusive, and secure data ecosystem within which many different players can obtain insight that improves decisions.

Urban digital twins are already transforming how cities are being planned, built, and managed, with examples appearing in cities across the world, including Helsinki, Dublin, Singapore, Sydney, Wellington, and more.

However, urban digital twins are not a 'solved problem'. Along with increased investment in research and development, the vision demands agreed-upon methodologies and standards, new commitments to data sharing and data privacy, forward-looking regulations, and the development of a robust global community that is as devoted to tradecraft as it is to technology.

These were some of the issues addressed at the 'Location Powers: Urban Digital Twins' virtual summit held on 12-14 January. The summit brought industry, research, and government experts from across the globe together into an interactive discussion that assessed the current state of the art and produced recommendations for future technology research, innovation, and standards development in support of urban development.

Speakers and participants were drawn from diverse fields of expertise including: urban geography; planning; governance; civil engineering; BIM; geospatial; the design, modelling, and operation of physical infrastructure; data science; machine learning; cloud/edge/fog computing; and more. Speakers presented on the current state of the art, best practices, and promising research surrounding urban digital twins, including applications in transport, utilities, energy and health.

To realise the promise of urban digital twins, summit participants agreed that governments, researchers, and industry must collaborate on three overarching priorities that will provide a foundation for successful urban digital twins: research and development; standards development; and community involvement.

Research and development

Participants identified several key areas that

require research and development to help planners and practitioners maximise urban digital twins' potential as well as remove barriers currently hindering adoption and execution. Such areas include: cultivation of digital twin base layers, including those for underground and indoor models; best practices for making models dynamic and current, including simplifying integration of disparate data from heterogeneous sources, such as sensors; co-creation for coordinating planning using multiple urban digital twins; development of digital twins for social use cases, such as mobility, public health and justice; data model linkages; and data sharing with an eye for security and privacy.

The recommendations and outcomes of the Location Powers Summit will now feed into OGC's Innovation Programme, where OGC members come together to solve just these types of geospatial challenges through a collaborative, agile process.

Standards development

From a technical standpoint, open standards play a critical role in urban digital twins to not only improve accessibility and functionality, but also reduce costs and increase value. The value of open standards to government, industry, academia, and wider society is a message that OGC has firmly believed in and promoted for its 25+ years of existence.

As such, OGC offers a suite of open standards of use and benefit to urban digital twins, including CityGML, IndoorGML, SensorThings, 3DTiles, i3S and our new OpenAPI-based 'OGC API' standards.

Areas identified by the summit participants as requiring further standards development or improvement include those for linking data models, and for capturing and sharing specialised data sets in areas such as energy, water, underground infrastructure and mobility. The knowledge gained from the discussions held at the Location Powers Summit will now feed into the OGC Standards Program with the aim to improve existing or develop new consensus-based data standards.

Cities are now filled with different sensors made by different vendors for different purposes: standards simplify their integration into urban digital twins

Community involvement

Successful urban digital twins require ongoing collaboration between multiple tiers of government, the private sector, public utilities, building owners, community groups, citizens and more. Just like standards, urban digital twins will only work if they are designed to accommodate diverse – and often unforeseen – viewpoints and use-cases.

Capturing and promoting best practices (as well as lessons learned) from across the globe can help ease the creation of urban digital twins while also promoting novel use-cases that may not otherwise be known to be possible. Some examples presented during the Location Powers Summit included: deploying energy digital twins to assist with cities' carbon-neutral objectives; using visualisation and gamification to generate interest and demand for urban digital twins; and building training and education programmes to develop a next-gen workforce that is fluent in creating and deploying urban digital twins.

The OGC community already has mechanisms for this type of knowledge sharing, as we have proudly cultivated a 'neutral ground' where different viewpoints and perspectives from across industry, government and academia can share knowledge and experience, and help build the open, consensus-based standards for which OGC is famous. The outcomes and knowledge gained from the summit will be briefed to the OGC community at the next (online) member meeting in March, during the Smart Cities Domain Working Group Meeting. For more information on this, including how to attend, visit meet.ogc.org.

The report detailing the OGC Location Powers: Urban Digital Twins Summit, its key takeaways, the opportunities inherent in urban digital twins, and the goals that government, industry, and academia must aim for in order to realise them, will soon be made available via ogc.org and locationpowers.net.

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