



Bentley Systems Accelerates Focus on Infrastructure Engineering for Digital Cities

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Advancing BIM and GIS through 4D Digital Twins

SINGAPORE – The Year in Infrastructure 2019 Conference – 23 October 2019 – Bentley Systems, Incorporated, the leading global provider of comprehensive software and digital twin cloud services for advancing the design, construction, and operations of infrastructure, today presented its new *digital cities* initiatives, applying digital twins for more efficient city and regional operations and for more connected and resilient infrastructure. Digital twins converge assets' 4D-surveyed and engineering representations to enable new collaborative digital workflows to serving planners and engineers in public works, utilities, property management and development, and city stakeholders. Digital twin cloud services provide an intuitive and immersive 4D environment converging *digital context* and *digital components* with *digital chronology* for "evergreen" infrastructure digital twins over asset lifecycles. For infrastructure professionals, BIM and GIS are effectively advanced through 4D digital twins.

Greg Bentley, CEO of Bentley Systems said, "Bentley Systems' major technical thrust is the advancement of digital twins across infrastructure domains. This finally opens up for owners their previously "dark" engineering technologies and data (ET), for federation with traditional information technology (IT) and newly connected operating technologies (OT). Correspondingly, because the opportunities for benefits are so compelling, our major organizational initiative is our new *digital cities* product advancement group. Our digital cities group's charter is both to ramp infrastructure engineering digital twins to full city scale, and at the same time to help with going digital through entry points for any engineering department in any municipality."

"At Bentley Systems we have long and rich histories in respectively geospatial technology (GIS), and in BIM, for municipal infrastructure applications spanning capex and opex," said Robert Mankowski, vice president, digital cities. "Today, I believe we are the leading innovator in reality modeling and in geotechnical modeling and data management. With our new cloud-based *iTwin Services* bringing this all together, city and campus digital twins now offer an immediate opportunity to help cities and regions solve a wide range of challenges and problems, enhancing their infrastructure performance and their constituents' quality of life."

Infrastructure Digital Twins for *Digital Cities*

City-scale digital twins begin and are updated through 4D surveying and reality modeling by *ContextCapture* and *Orbit GT* to derive as-operated 3D models from photogrammetry (including from UAVs) and/or point clouds. Reality modeling provides engineering-precise, real-world context to support planning, design, construction, and operations. Users of Bentley's open applications (*OpenBuildings*, *OpenSite*, *OpenRoads*, *OpenRail*, *OpenUtilities*) can leverage this digital context to model new and improved buildings, roads, transit systems, tunnels, bridges, utilities, and more.

4D digital twins become a common and federating index for previously siloed information, without requiring source systems to change their existing environments or data formats. The foundation context for any digital twin includes reality meshes, terrain models, imagery, and GIS sources. Engineering models (from any BIM software) of buildings, streets, transit systems, utilities, and other city infrastructure, both surface and subsurface, are semantically aligned and geo-referenced to enhance the richness and relevance of digital twins over time.

Public works departments, property developers, utilities, transportation agencies, and others now have access to a full and current contextual view of the built environment. Engineering and architectural firms will be able to develop new services that contemplate updating and managing digital assets over their lifecycles. And, cities will benefit from living and current digital twins of their infrastructure and surrounding environment.

Sustainability and Resilience Digital Twins

Now, cities can combine their surface and subsurface surveys and engineering data into cohesive 4D digital twins to ensure over time their asset performance, resiliency, and sustainability. Using Bentley's open simulation applications during asset lifecycles, for example, as-constructed buildings can be evaluated for seismic resilience (*STAAD*), the evacuation of vehicles and people in stations, stadiums, and other public places can be assessed and optimized (*LEGION* and *CUBE*), the impact of flooding events like hurricanes can be determined (*OpenFlows FLOOD*), and the suitability of subsurface conditions for urban projects can be ensured (*PLAXIS*, *SoilVision*).

Geotechnical Digital Twins: Introducing *OpenGround*

Bentley's geotechnical engineering and analysis applications empower *subsurface* digital twins, critical for assessing and managing risks in infrastructure projects and assets. Subsurface digital twins entail modeling of the underground environment, including the geology, hydrology, chemistry, and engineering properties, made possible by Bentley's geotechnical offerings (*PLAXIS*, *SoilVision*, *Keynetix* and *gINT*). To further enable subsurface digital twins, Bentley today announced *OpenGround*, a new cloud service (available end of 2019) to store, manage, report, and share data about natural ground conditions.

Water Network Digital Twins

Building upon its deep experience with hydraulics and hydrology software, Bentley is introducing [OpenFlows WaterOPS](#) for water and wastewater utility operators. OpenFlows WaterOPS provides water and wastewater utilities with real-time operational support, smart water response planning, and optimized performance and business intelligence, converging IT (GIS) with OT (telemetry, SCADA instrumentation, sensors) and ET (hydraulic simulation). WaterOPS provides real-time operational decision support extending Supervisory Control and Data Acquisition (SCADA) to help users monitor, maintain, and forecast various hydraulics and water quality scenarios.

City Planning Digital Twins

Digital twins for cities have many stakeholders, including constituents not directly involved in engineering or infrastructure. Now hosted in Microsoft Azure, [OpenCities Planner](#) delivers cloud-based, city-scale digital twins to improve stakeholder and citizen engagement and to simplify and facilitate urban development. Addressing a wide variety of potential use cases, OpenCitiesPlanner helps users, through devices like web, mobile, touchscreens, and digital billboards, to intuitively visualize and explore 2D, 3D, GIS and other data aligned with the reality modeling of the city.

Digital Co-ventures for Digital Cities

(With Topcon) Cloud-based photogrammetry processing powered by Bentley's ContextCapture is incorporated in Topcon MAGNET Collage Web, a web-based service for publication, sharing, and analysis of reality capture data. The intrinsic [Bentley ContextCapture Cloud Processing Service](#) enables operators to upload UAV imagery direct-to-web without the need for high-end hardware requirements or IT constraints.

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About Bentley Systems' Digital Cities Offerings

Bentley Systems undertakes to advance BIM and GIS through 4D infrastructure engineering digital twins for digital cities. Engineers, geospatial professionals, and infrastructure owner-operators benefit from applications and digital twin cloud services that advance reality modeling (*ContextCapture* and *OrbitGT*); water, wastewater, and stormwater system planning, design and operations, and flood resilience (*OpenFlows*); engineering-ready geospatial urban planning and visualization (*OpenCities Map* and *OpenCities Planner*); geotechnical information management (*OpenGround*); and mobility simulation and analytics (*LEGION* and *CUBE*).

In both 2018 and 2019, Microsoft named Bentley Systems as Partner of the Year in its CityNext category. In 2019, ARC Advisory Group's *Engineering Design Tools for Plants, Infrastructure, and BIM* market study ranked Bentley #1 in Water and Wastewater Distribution.

About Bentley Systems

Bentley Systems is the leading global provider of software solutions to engineers, architects, geospatial professionals, constructors, and owner-operators for the design, construction, and operations of infrastructure, including public works, utilities, industrial plants, and [digital cities](#). Bentley's *MicroStation*-based open modeling applications, and its open simulation applications, accelerate [design integration](#); its *ProjectWise* and *SYNCHRO* offerings accelerate [project delivery](#); and its *AssetWise* offerings accelerate [asset and network performance](#). Spanning infrastructure engineering, Bentley's *iTwin Services* are fundamentally advancing BIM and GIS to 4D digital twins.

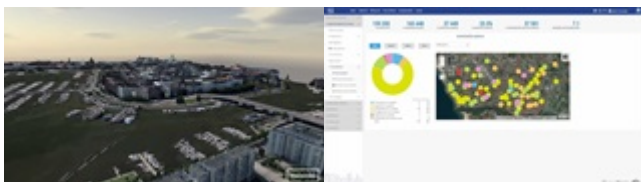
Bentley Systems employs more than 3,500 colleagues, generates annual revenues of \$700 million in 170 countries, and has invested more than \$1 billion in research, development, and acquisitions since 2014. From inception in 1984, the company has remained majority-owned by its five founding Bentley brothers. www.bentley.com

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The City of Helsinki leveraged Bentley's reality modeling software to generate a 3D representation of Helsinki as part of its smart city initiative, improving internal services and processes.



Image courtesy of City of Helsinki.



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