



4D Digital Twin Visualization: Bringing Infrastructure Projects to Life

David Burdick – Senior Product Manager, Bentley Systems

Bentley[®]
Advancing Infrastructure

Key Issues

- How are Digital Twins Accelerating Infrastructure Project Success?
- What are the Primary Benefits of 4D Digital Twin Visualization?
- How does Bentley's LumenRT for NVIDIA Omniverse Bring Infrastructure Projects to Life?

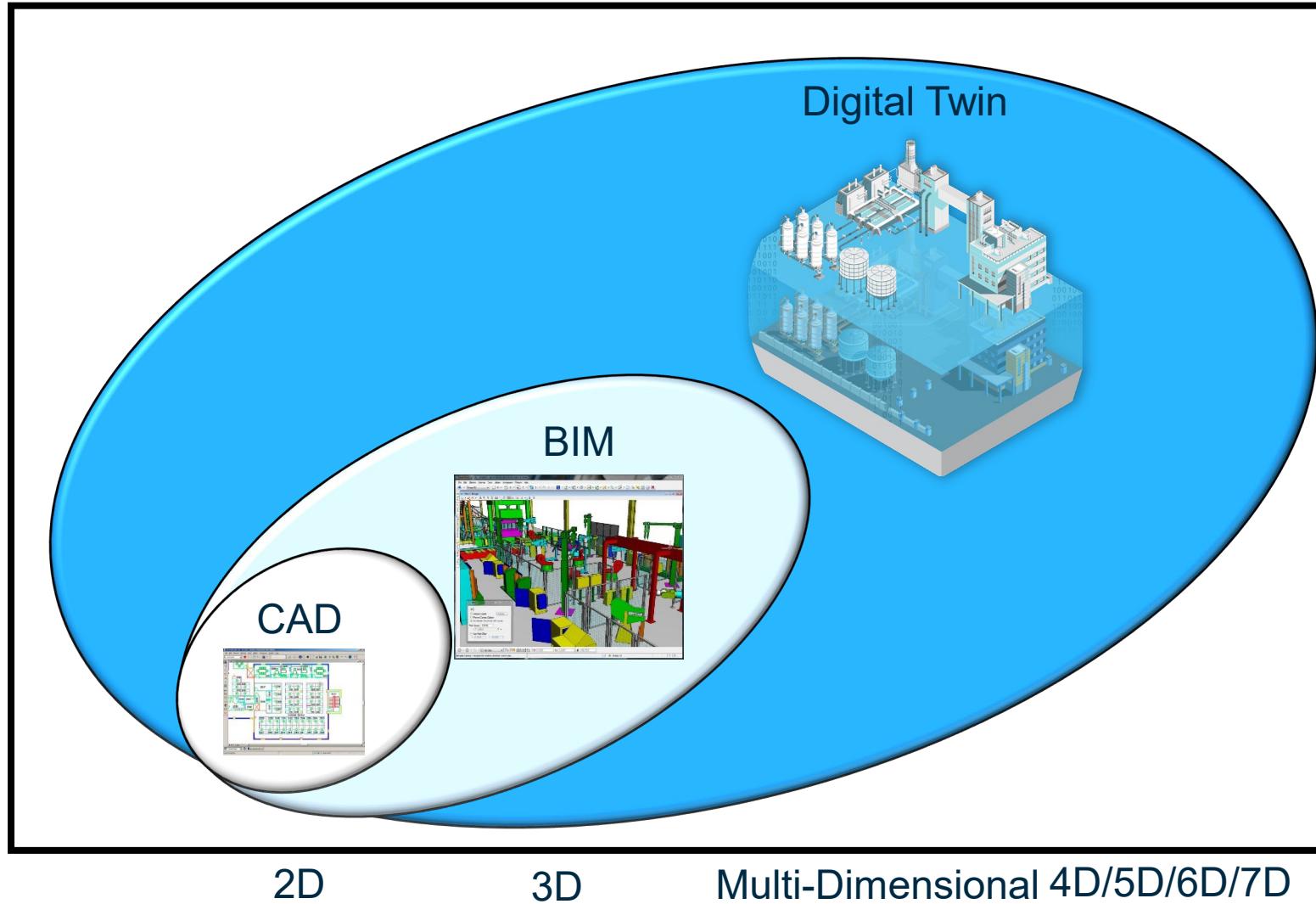
Key Issue: How are Digital Twins Accelerating Infrastructure Project Success?

Project Scope

Operate

Build

Design



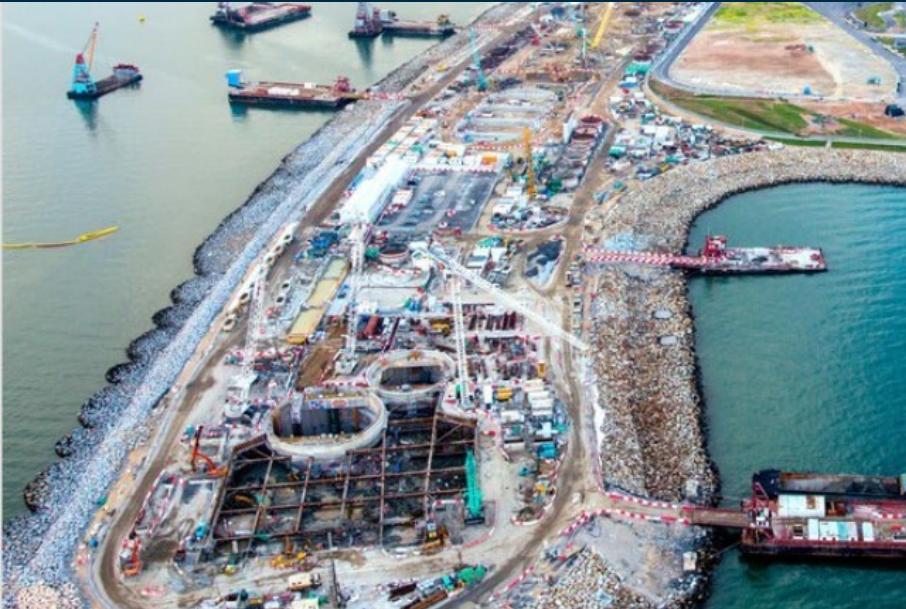
2D = Documents
3D = Models
4D = Time
5D = Cost
6D = Sustainability
7D = Facilities Management

Information Scope

Infrastructure Grade Digital Twins

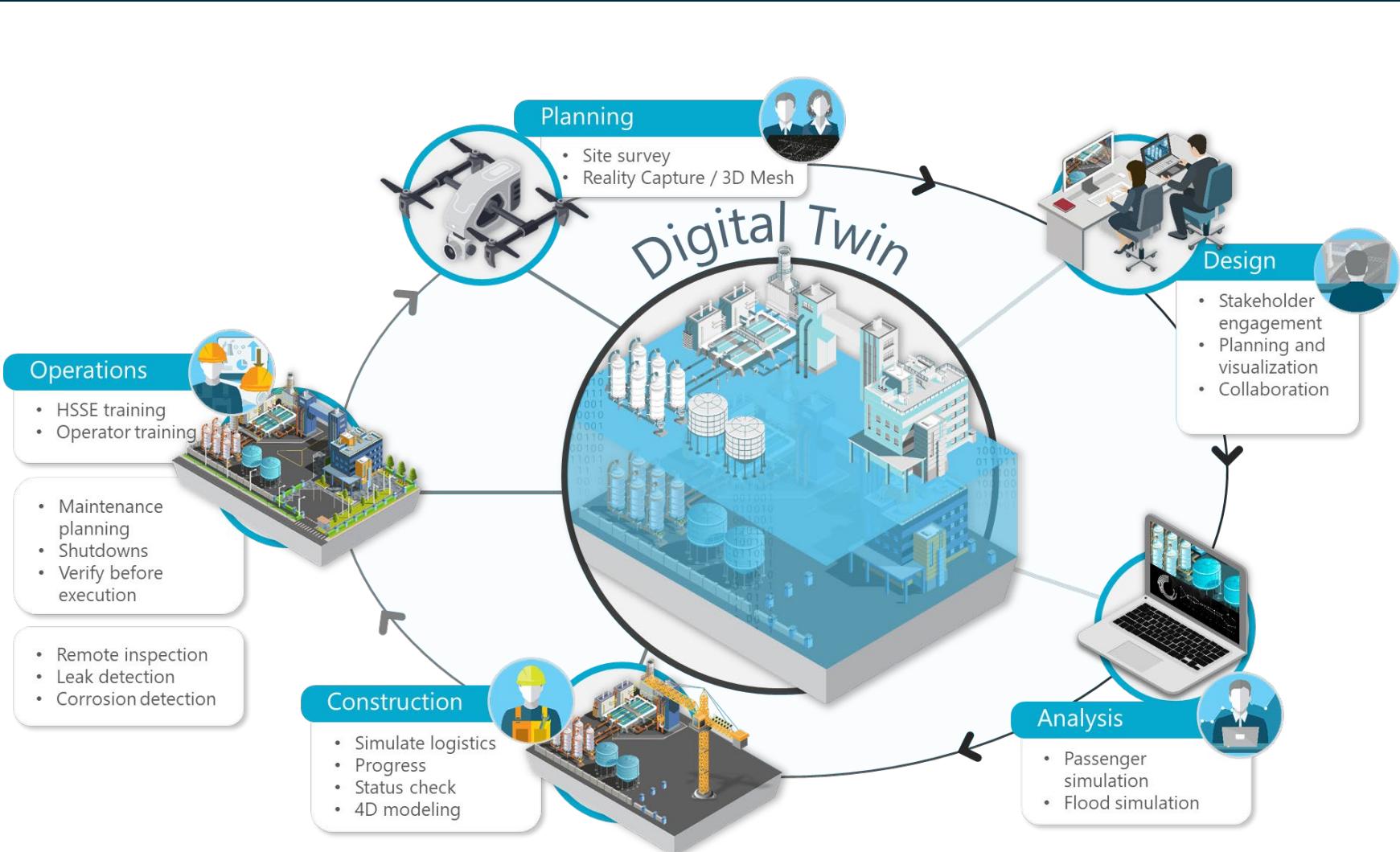


Infrastructure Grade Digital Twins



- **Scale**
Handle massive projects with millimeter precision

Infrastructure Grade Digital Twins



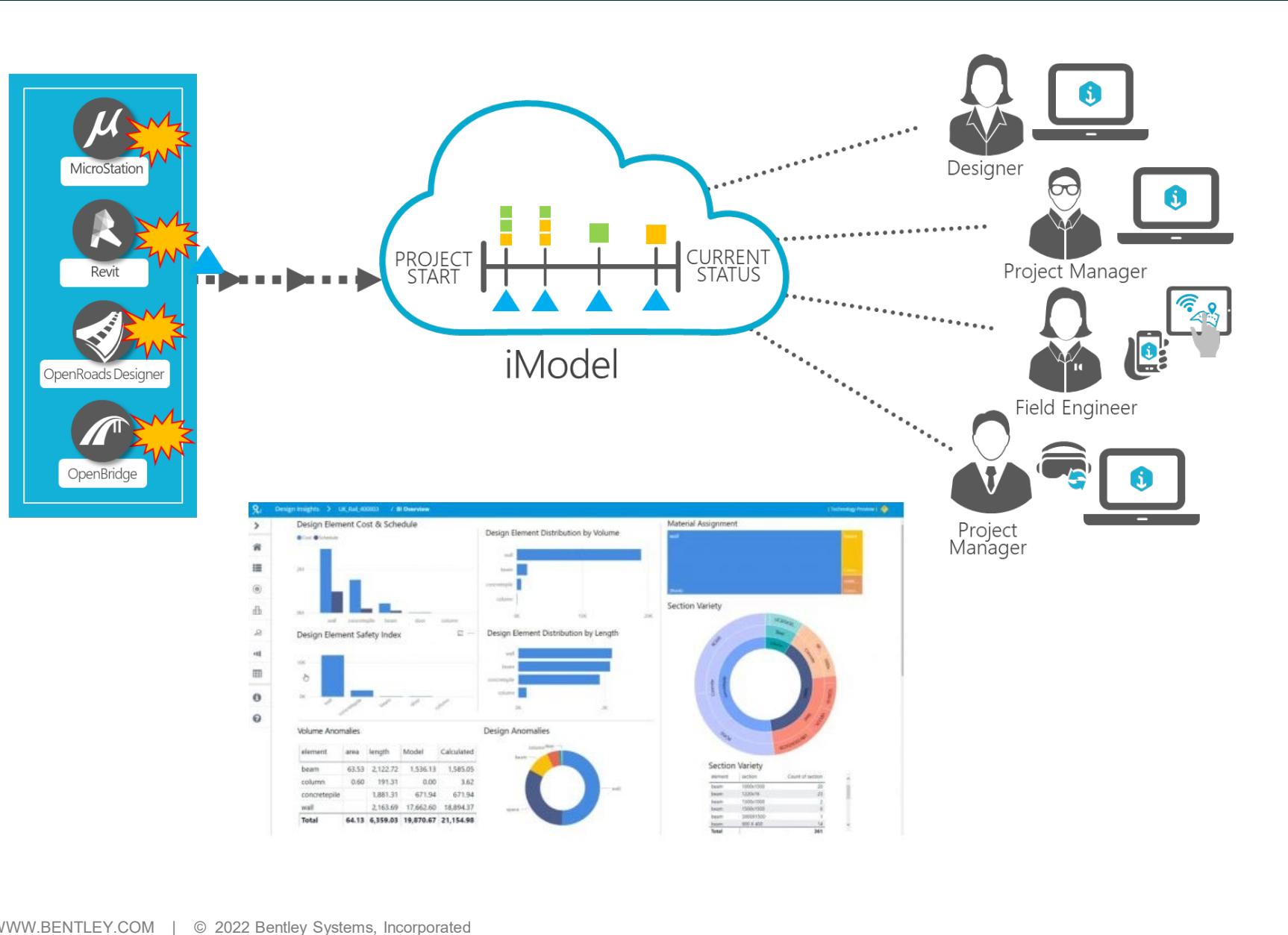
- Scale**

Handle massive projects with millimeter precision

- Scope**

Work seamlessly across all project phases with multi-faceted data

Infrastructure Grade Digital Twins



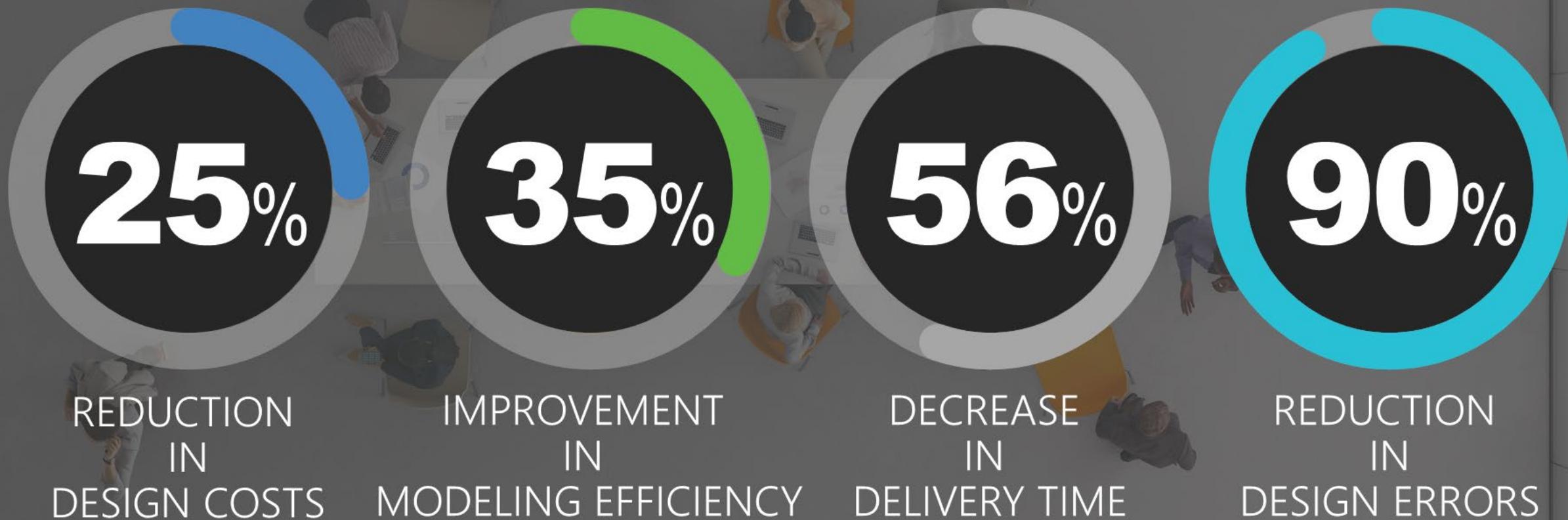
- Scale**
Handle massive projects with millimeter precision
- Scope**
Work seamlessly across all project phases with multi-faceted data
- Accountability**
Agile workflows with robust change management and traceability

iTwin Success Drivers



- **Single source of truth**
Harness and leverage digital assets to improve accuracy and quality
- **Seamless collaboration**
24/7 communication anywhere in the world
- **Improve decision making**
Leverage lessons learned to solve small problems before they become big problems
- **Speed project delivery**
Shorten the delivery schedule

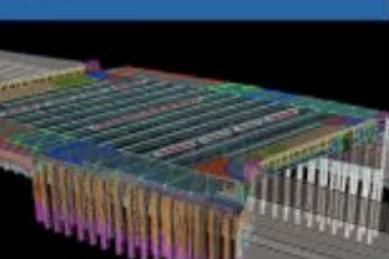
Realized Benefits





The Year in **INFRASTRUCTURE** and GOING DIGITAL AWARDS

BRIDGES



East 138th Street over the Major Deegan Expressway

New York State Department of Transportation
United States of America

BUILDINGS & CAMPUSES



High-tech Multifunctional Medical Complex

Volgogradnefteproekt, LLC
Russian Federation

DIGITAL CITIES



Ezhou Huahu Airport Project

Hubei International Logistics Airport Co., Ltd., Shenzhen S.F. Taisen Holdings (Group) Co., Ltd., Airport Construction Engineering Co., Ltd.
China

GEOTECHNICAL ENGINEERING



Geological Survey of Water Conservancy and Hydropower Eng.

China Water Resources Beifang Investigation, Design and Research Co. Ltd.
China

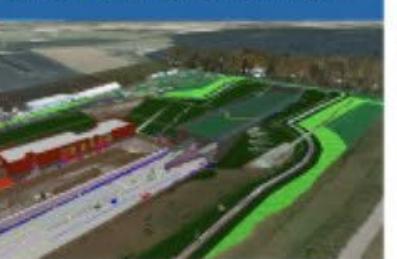
POWER GENERATION



Wuqiangxi Hydroelectric Power Station Expansion Project

PowerChina ZhongNan Engineering Corporation Limited
China

PROJECT DELIVERY INFO MNGMT



HS2 Phase 1 Main Civil Construction Works

Mott MacDonald Systra JV with Balfour Beatty Vinci
United Kingdom

PROJECT DELIVERY INFO MNGMT



Port of Melbourne - Port Rail Transformation Project

WSP
Australia

RAIL & TRANSIT



MRT Jakarta Phase II

PT MRT JAKARTA (Perseroda)
Indonesia

RAIL & TRANSIT



Transpennine Route Upgrade

Network Rail + Jacobs
United Kingdom

REALITY MODELING



Diablo Dam Digital Twin Modeling

HDR

United States of America

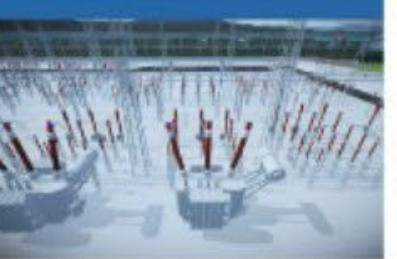
ROAD & RAIL ASSET PERFORMANCE



Stone Arch Bridge Rehabilitation

Collins Engineers, Inc.
United States of America

UTILITIES & COMMUNICATIONS



Digitization of Koh Kong 230/22kV Substation

PESTECH INTERNATIONAL BERHAD
Malaysia

UTILITIES & COMMUNICATIONS



Suixian & Guangshui 80MWp Ground-Based Photovoltaic Power Project of Hubei Energy Group
PowerChina Hubei Electric Eng. Co. Ltd.
China

WATER & WASTEWATER TREATMENT PLANTS



F. Wayne Hill Water Resources Center Membrane Improvements

Jacobs Engineering
United States of America

WATER & WASTEWATER TREATMENT PLANTS



Implementing Digital Twins on a Fully Collaborative Project

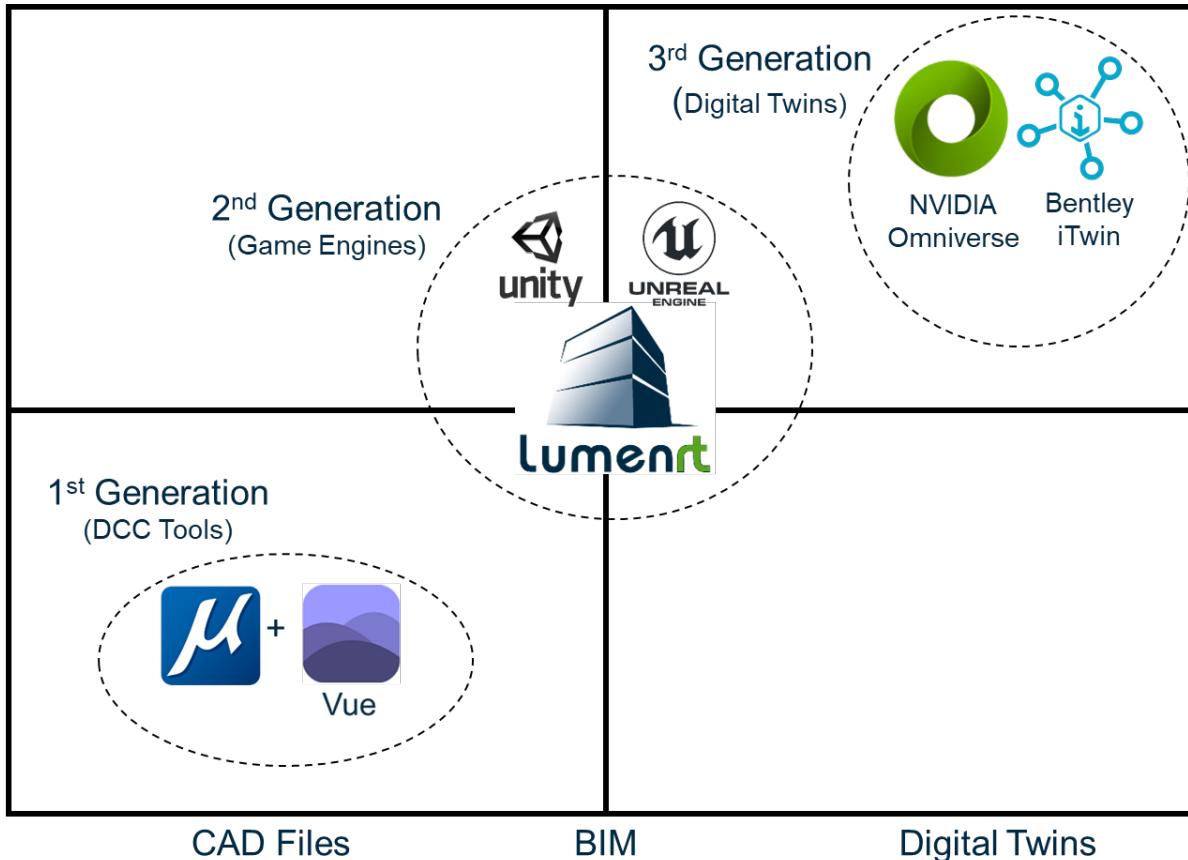
Brown and Caldwell
United States of America

Key Issue: What are the Primary Benefits of 4D Digital Twin Visualization?

AI Enhanced 4D Cloud

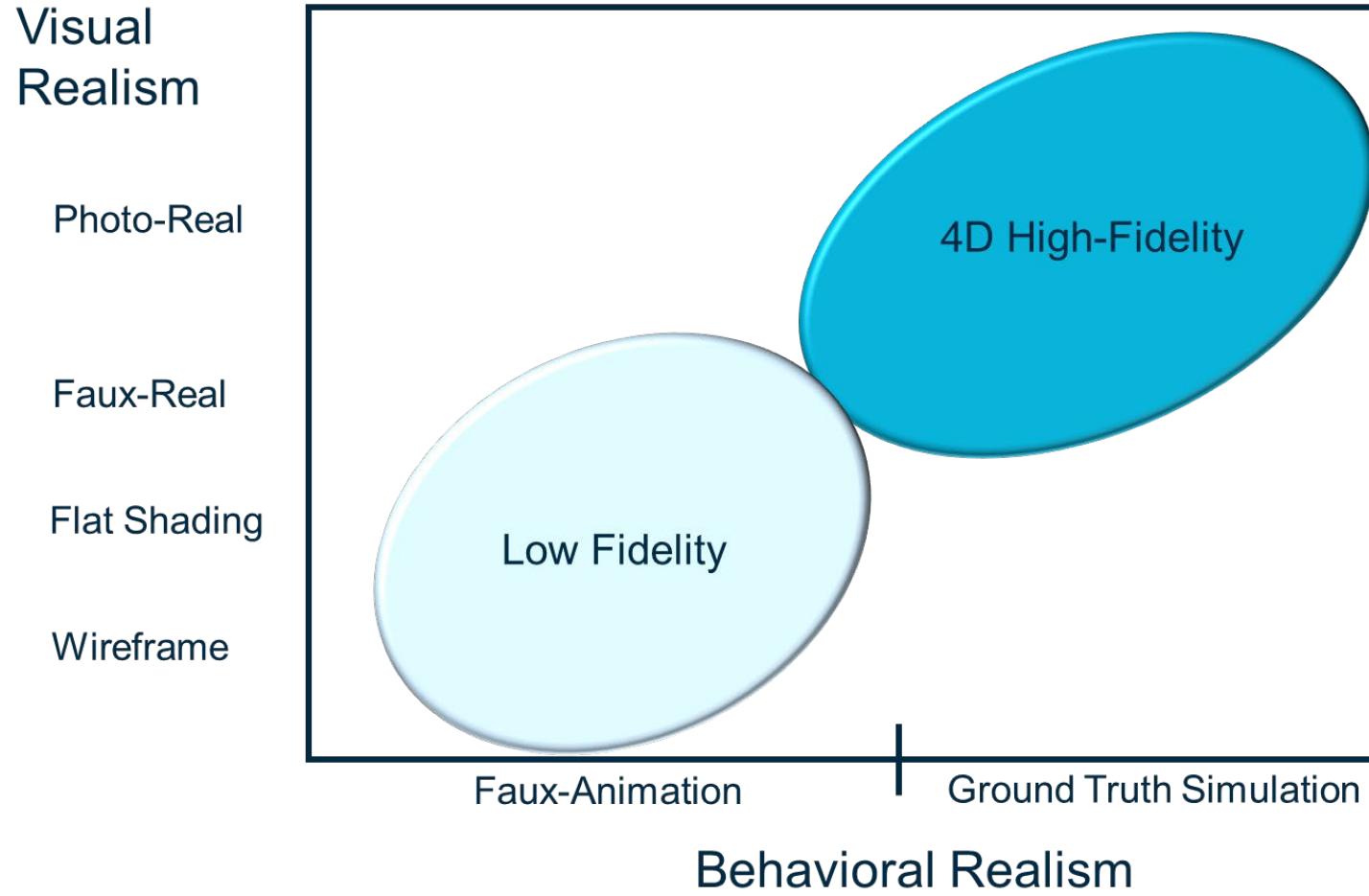
Game Engine Laptop

DCC Tools
Render Farms



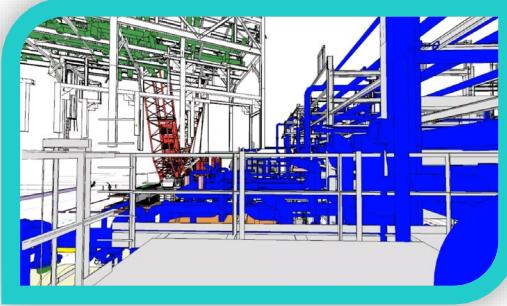
| CAD/BIM | Digital Twin |
|---------------------------|------------------------------|
| Disconnected process | Integrated “instant on” |
| Visualization specialists | Any Digital Twin stakeholder |
| Days and weeks | Seconds and Minutes |
| One CAD file at a time | Continuously synched iTwin |
| 2D, 3D | 4D, 5D, 6D |
| Render geometry | Visualize behaviors |
| Images and videos | Immersive Experiences |

4D Digital Twin Visualization = High-Fidelity Realism



4D Digital Twin Visualization Areas of Opportunity

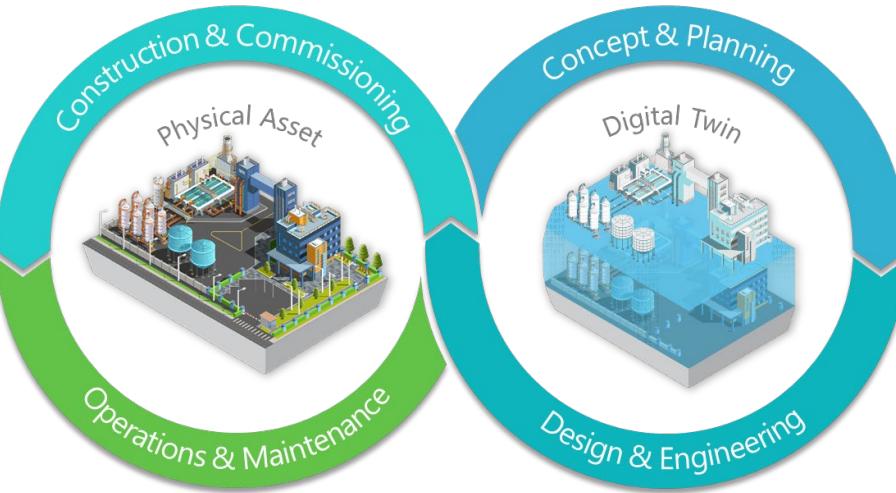
Real-Time Clash Detection



Construction Animations



Immersive Training



Asset Monitoring



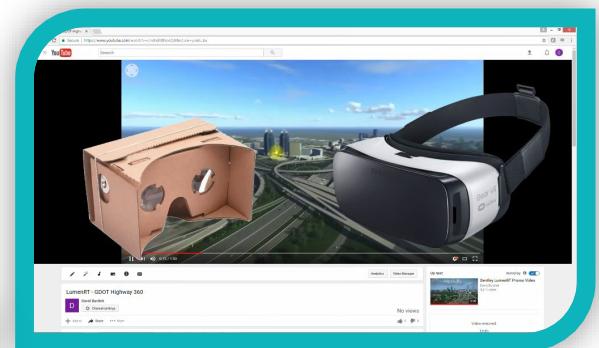
Design Simulation



Pursuit Presentations



Virtual Design Reviews



Bentley®

Advancing Infrastructure



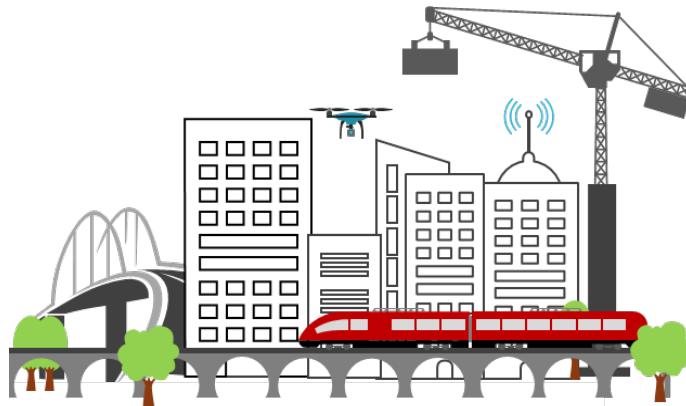
LumenRT
for NVIDIA Omniverse

Bring your iTwins to Life

Why Omniverse?



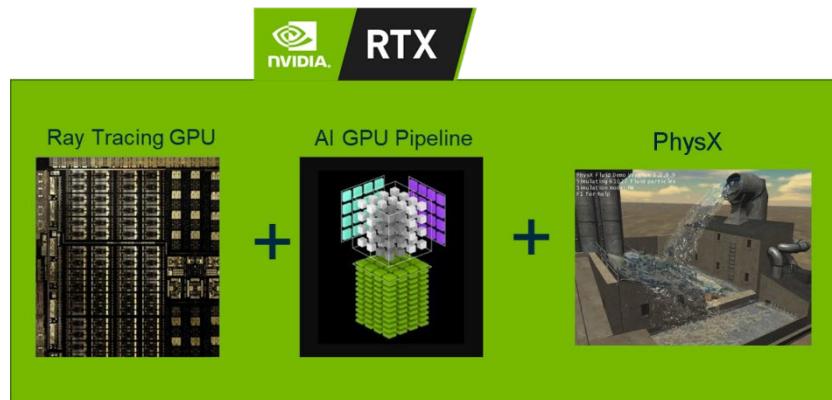
Scale



Platform Extensibility



Technology Leadership



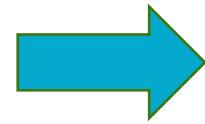
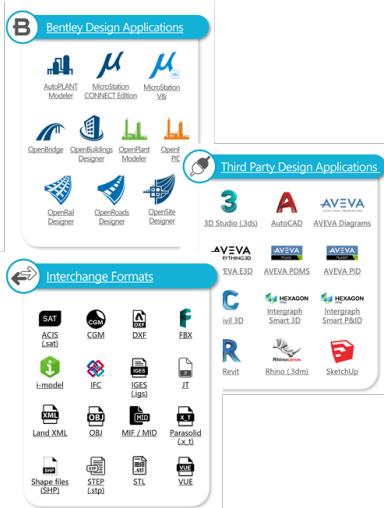
Partnership Team



iTwin Omniverse Connector



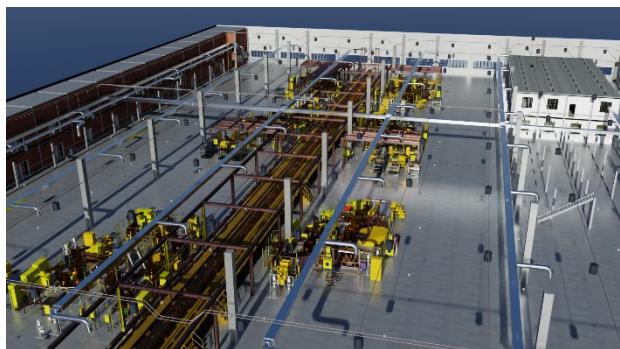
Source Data



Bentley iTwin

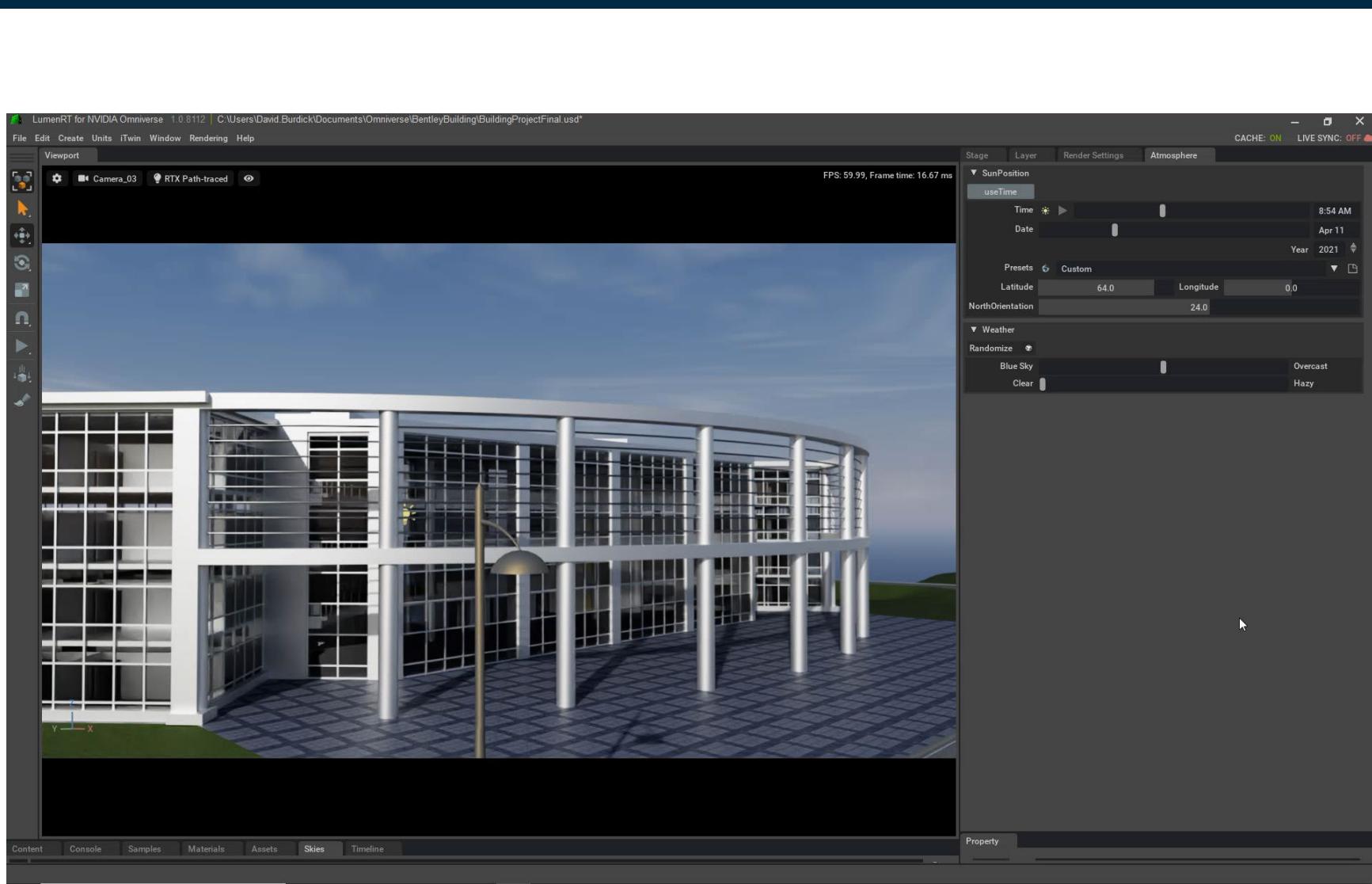


LumenRT for NVIDIA Omniverse



- Converts iTwin to USD
- Optimized/Partitioned models
- Support for change sets and automated material mapping (beta)

Sun and Atmosphere Editor



- Dynamically adjust atmosphere settings
- Haze and cloud cover
- Date and time of day

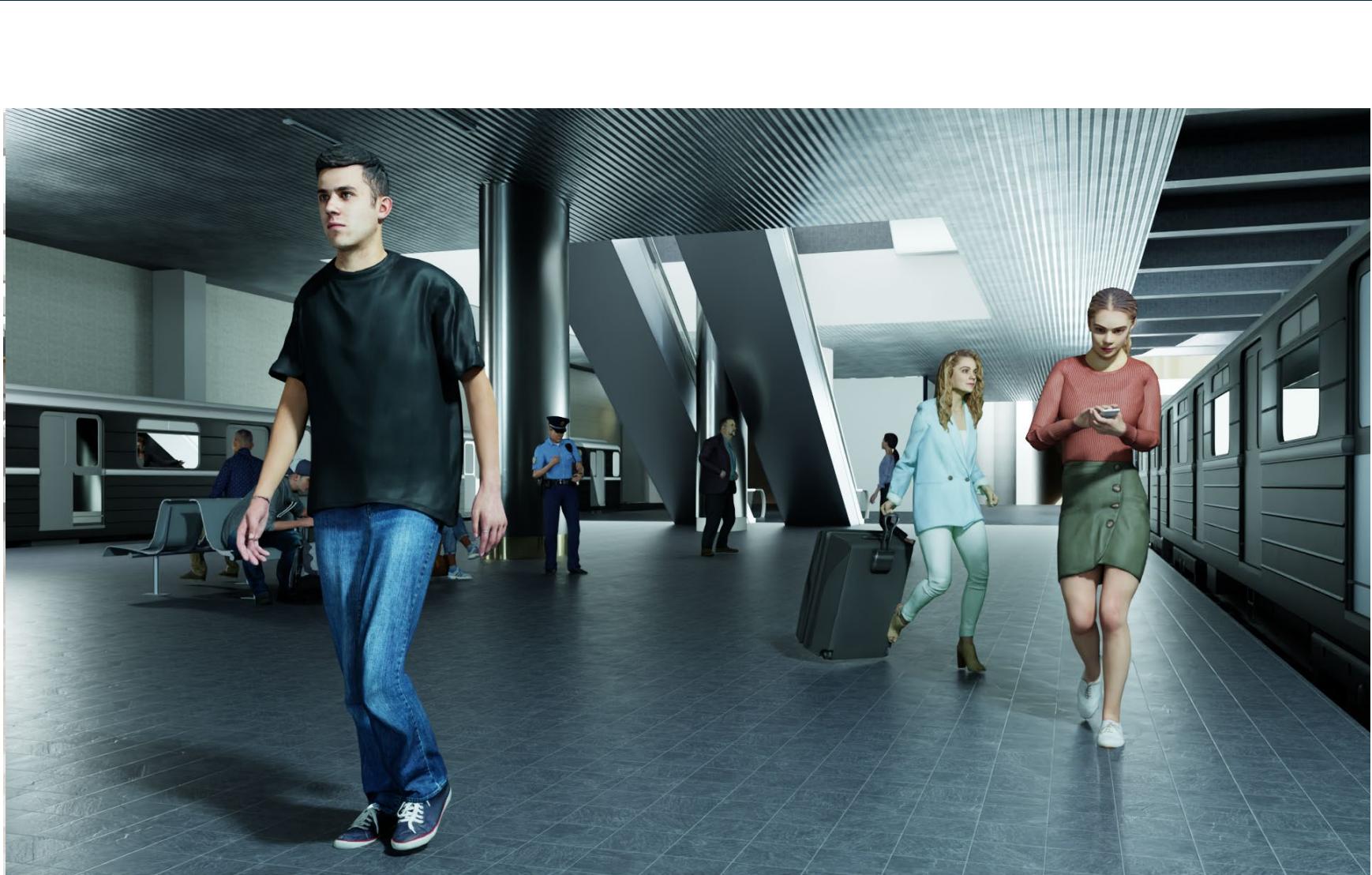
Synchro 4D Construction Integration



A screenshot of the Synchro Control software interface. The top navigation bar shows "SYNCHRO Control" and the URL "construction.bentley.com/437e02f9-ab73-43a2-b525-f340f9579854/tasks". The main workspace displays an aerial view of a construction site for the "LumenRT_Synchro_002 Mortenson GSW Stadium" project. A large brown rectangular area represents a task, with orange and blue sections indicating progress or specific activity zones. Labels like "GATE 1", "GATE 2", and "GATE 3" are visible on the site. The interface includes various toolbars and a timeline at the bottom showing dates from "2/14/2017 12:00:00 AM" to "12/24/2018 5:00:00 PM". A legend indicates "GSW Stadium Only" and "PRIMARY". The left sidebar has icons for Home, Work, Documents, Schedule, Cost, Dashboard, and Administration, with "Work" currently selected.

- iTwin connected
- Full 4D construction schedule animation
- Enliven scenes using LumenRT for NVIDIA Omniverse

Reallusion Characters



- High-fidelity, lifelike
- Multi-behavioral with broad motion library
- Seamlessly integrated into Omniverse

e-on Software Vegetation



TIPS & TRICKS

PlantFactory and PlantCatalog
integration with Omniverse



- Fully integrated into Omniverse
- PlantCatalog – 100's of adjustable plants
- PlantFactory – design and build custom plants