TMC Winterschool

VNMG 2019

Highlights van Bentley congres Year in Infrastructure 2019

Let's talk about advancing BIM through Digital Twins

Slavco Velickov, Regional Director

Summary

- 1471 External participants + 300 Bentley Colleagues + 230 Bentley Channel Partners

Advancing BIM and GIS *through (4D!) Digital Twins…*

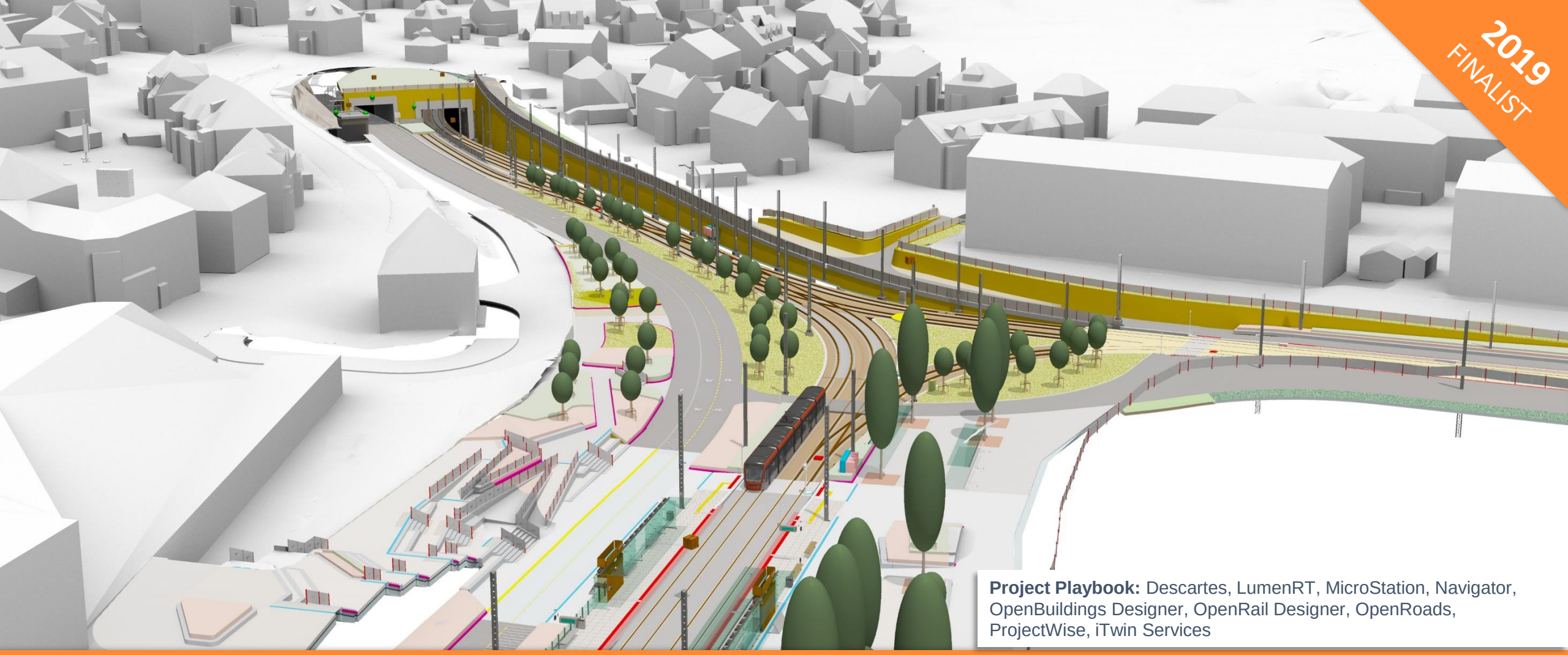
571 NOMINATED **PROJECTS**

representing **project locations** in

60+ **COUNTRIES**

and

400+ **CITIES**



2019 FINALIST

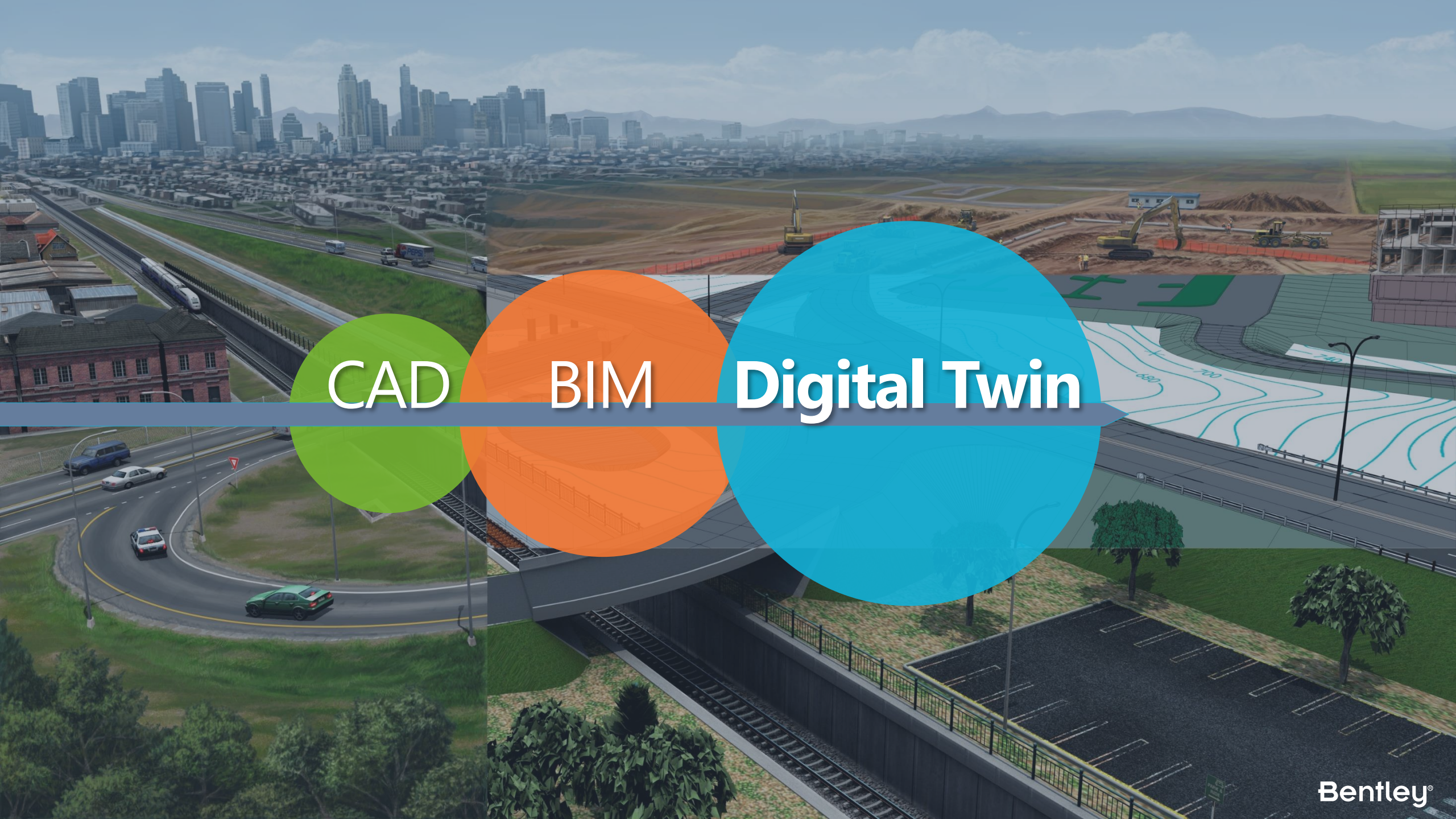
Project Playbook: Descartes, LumenRT, MicroStation, Navigator, OpenBuildings Designer, OpenRail Designer, OpenRoads, ProjectWise, iTwin Services

The Year in INFRASTRUCTURE 2019 AWARDS
FINALIST

Going Digital: Advancements in Rail and Transit

Sweco Nederland B.V.
Bergen Light Rail Norway
Bergen, Hordaland, Norway

Bentley


CAD
BIM
Digital Twin
Bentley

Digital Twin(ning) - Dictionary

- Reality Capture – **data inwinning**sproces om de huidige staat van infrastructuur vast te leggen via sensors (lidar, aerial photos, terrestrial photos, etc).
- Reality Modeling – het verwerken van de ingewonnen data naar een **mesh model** die de geometrie en visualisatie van een gebouw of gebied vast legt.
- BIM/CAD/IFC/CityGML model – individuele modellen (gebouw, brug, etc) die de geometrie in **ontwerp**detail beschrijft, samen met codering van de onderdelen.
- Digital Twin – **combinatie** van Reality Model **met semantische informatie** zoals eigendom, materiaal, onderhoud, kosten, op *continue basis.* Kan gecombineerd worden met ontwerp data.
- Digital Twin(ning) – het proces om de juiste data op regelmatige of continue basis te **onderhouden**.
- iTwin Services – (smart)Apps die Digital Twin **data consumptie**- of applicatie klaar maakt

CAD

2D

GIS

2.5D

BIM

3D

Digital Twins

4D

Change Synchronization

Immersive Visualization

Analytics Visibility

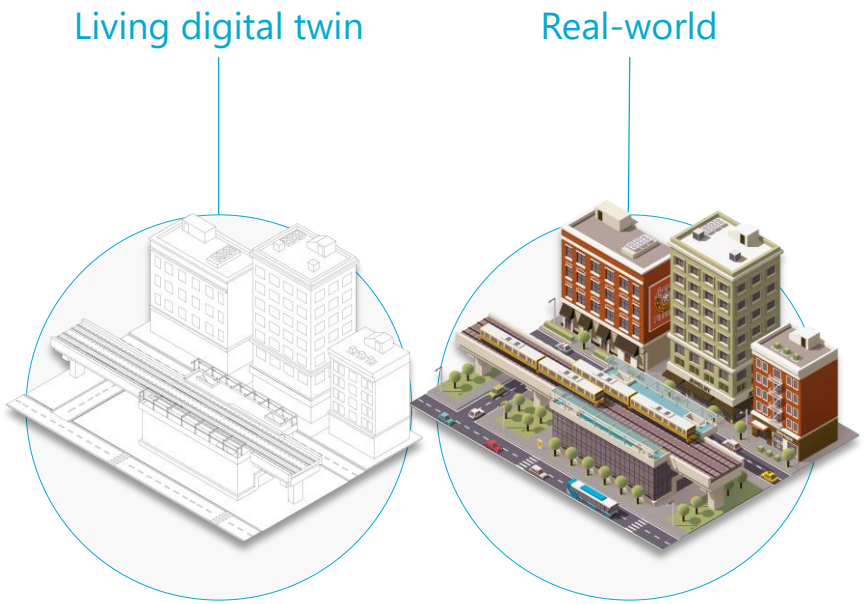
“Static Deliverables”

“Evergreen” Visibility

A digital twin is a digital representation of a physical asset, process or system, as well as the engineering information that allows us to understand and model its performance.

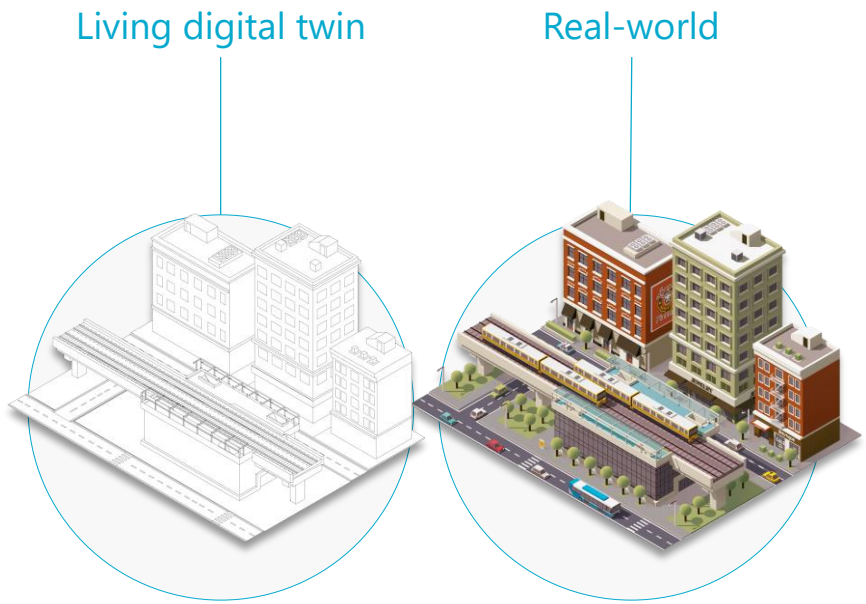
Typically, a digital twin can be continuously updated from multiple sources, including sensors and continuous surveying, to represent its near real-time status, working condition or position.

A digital twin enables users to visualize the asset, check status, perform analysis and generate insights in order to predict and optimize asset performance.



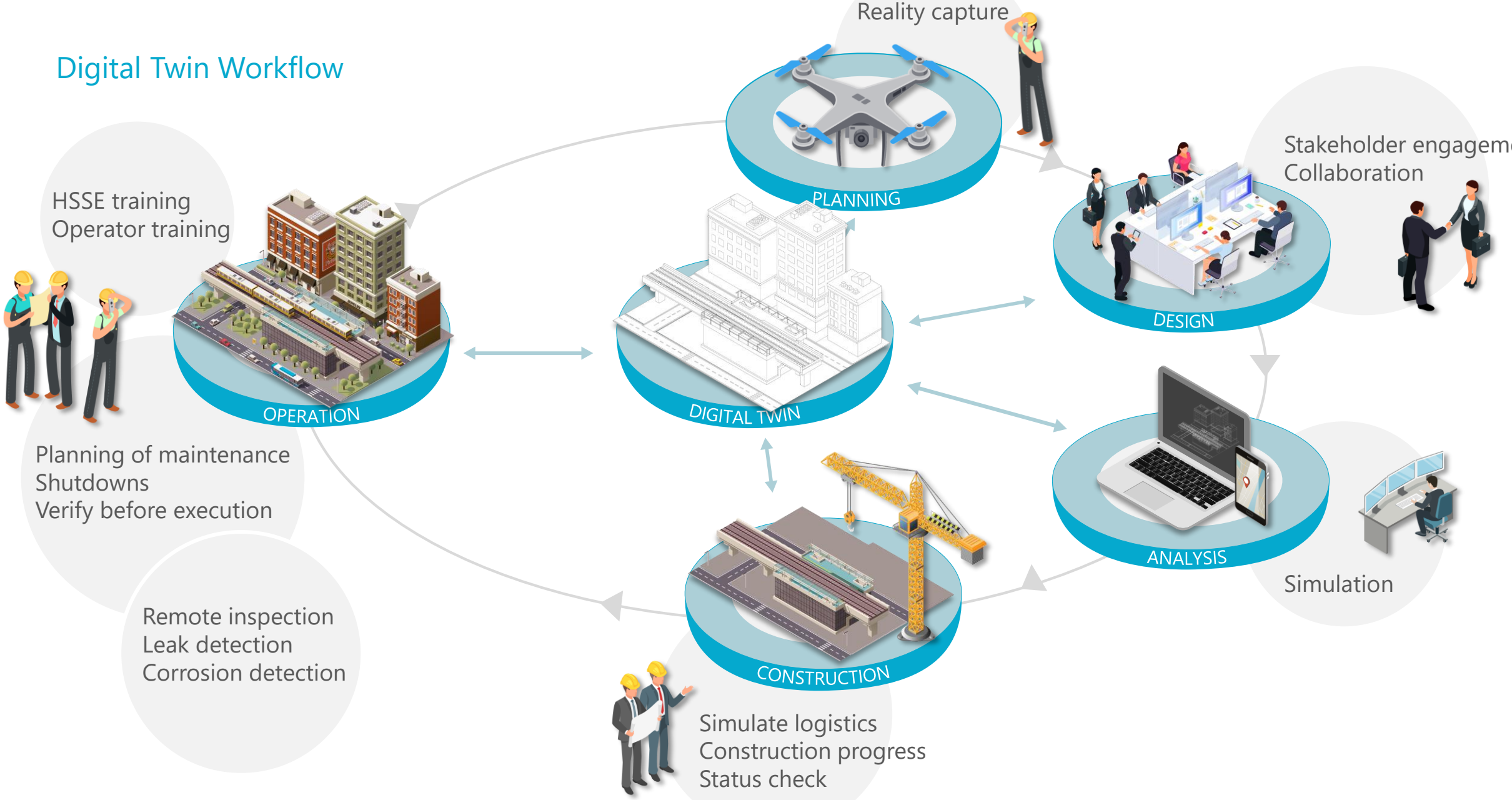
Bentley

Engineering Technology	Specs Drawings Documents Models	Analyses Geotech OEM specs	3D / XR → Immersive Visualization
Operations Technology	IoT feeds Sensors Drones	Cameras LiDAR Point clouds	4D → Timeline of Change
Information Technology	Asset tags Work orders Inspection records	Maint records	AI/ML → Analytics Visibility

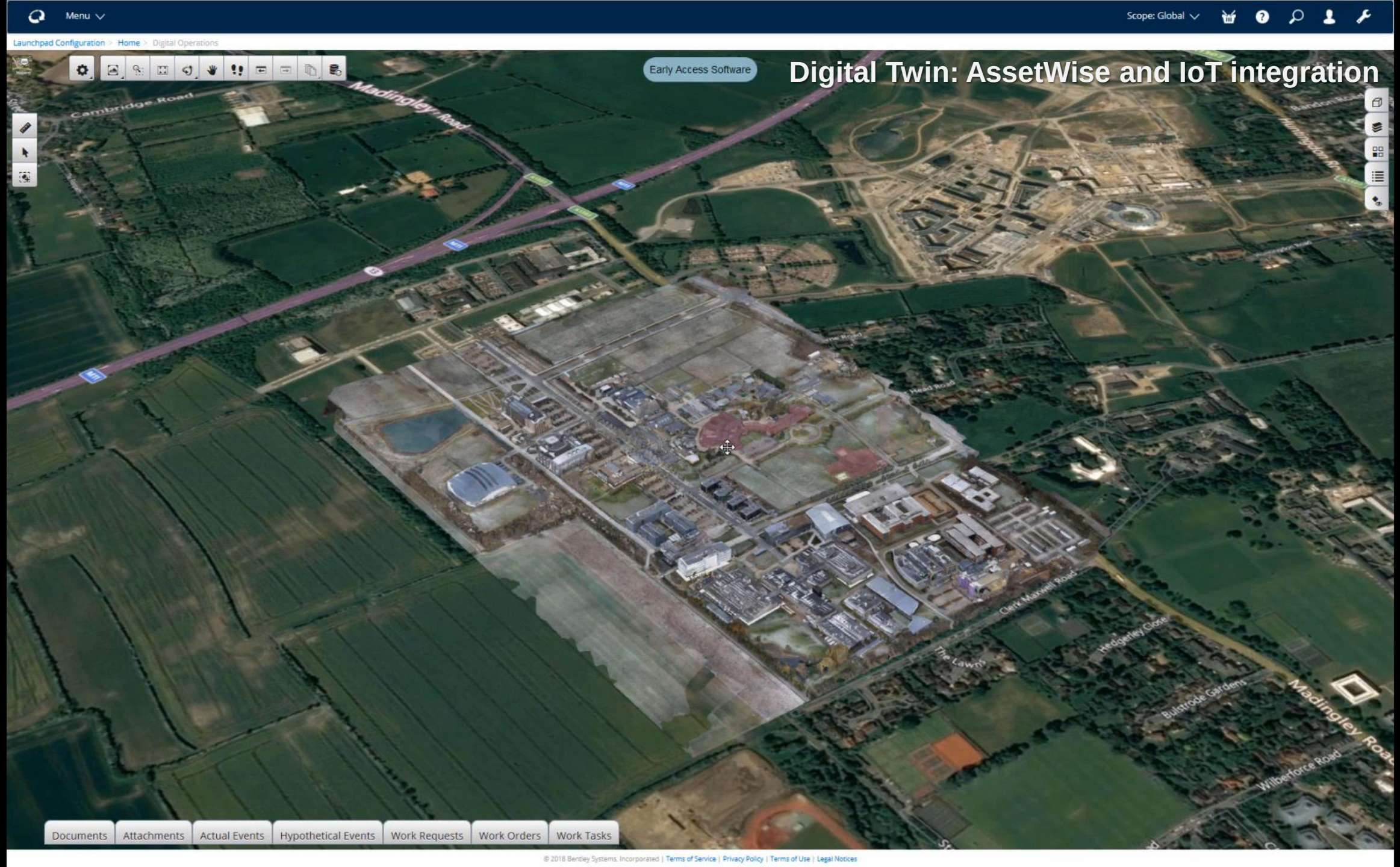


Bentley

Digital Twin Workflow



Bentley


Menu
Scope: Global
Launchpad Configuration > Home > Digital Operations
Early Access Software
Digital Twin: AssetWise and IoT integration
Cambridge Road
Madingley Road
Clerk Maxwell Road
Hedgerley Close
The Lawns
Bulstrode Gardens
Wilberforce Road
Madingley Road
Documents
Attachments
Actual Events
Hypothetical Events
Work Requests
Work Orders
Work Tasks
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Bentley Acquisition's

Bentley
Advancing Infrastructure

News Release
Press Contact:
Jennifer Maguire
+1 610 458 2695
jennifer.maguire@bentley.com
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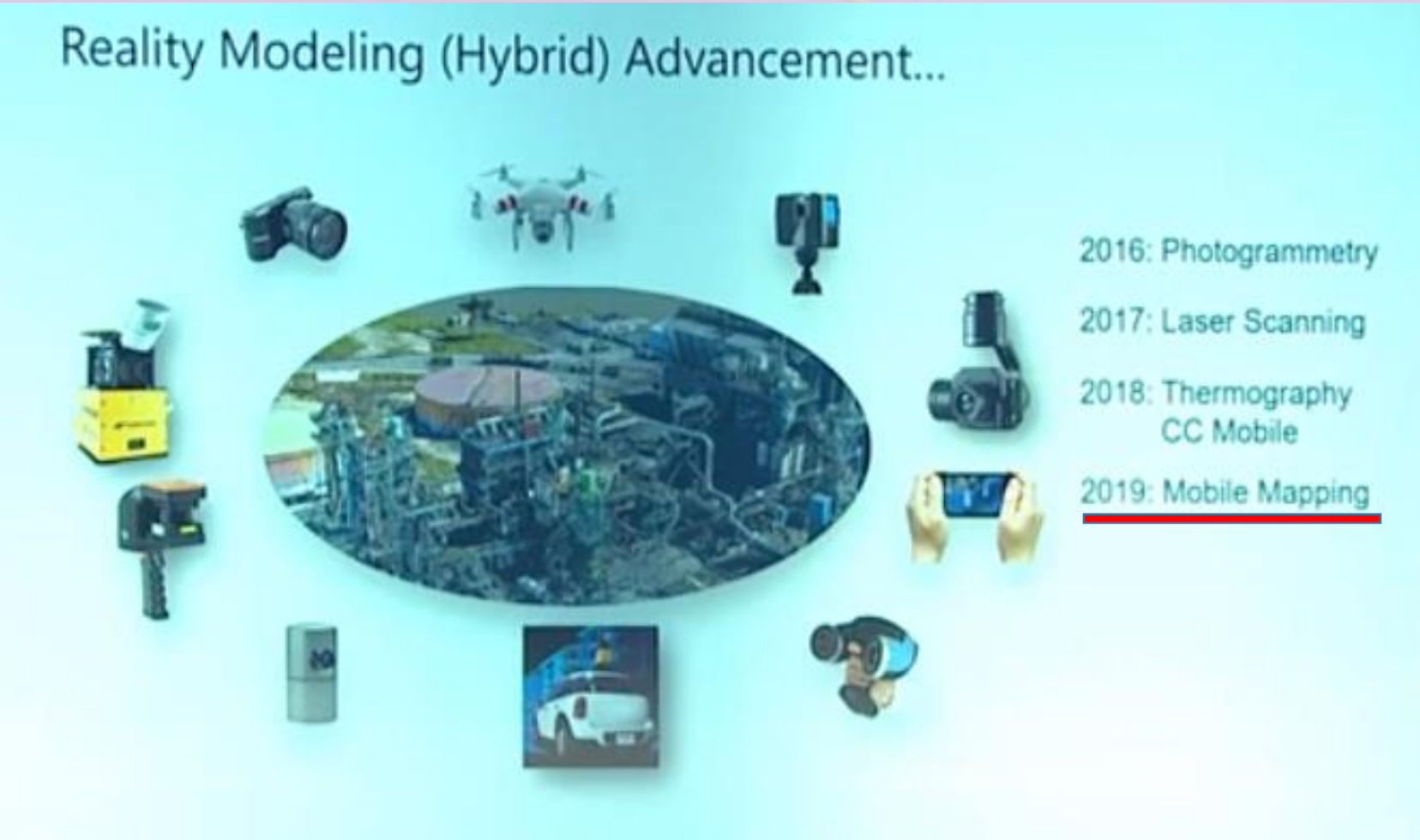
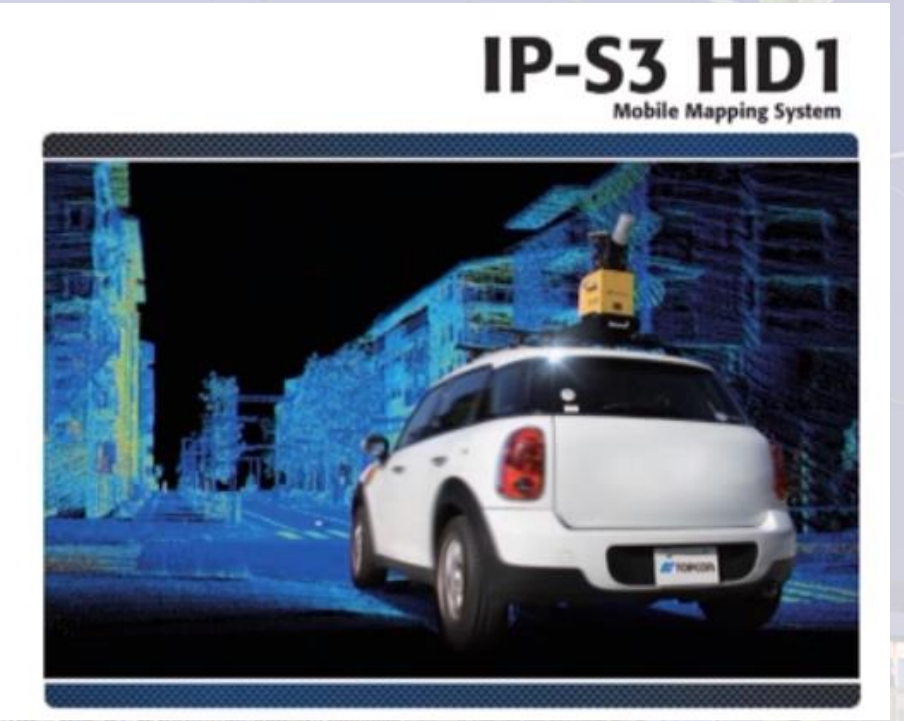
Bentley Systems Bolsters Digital Cities Offerings with Acquisitions of *Citilabs* and *Orbit Geospatial Technologies*

Advancing mobility digital twins through Orbit GT*'s automated mobile mapping workflows (digital context) and Citilabs'* CUBE *simulations (digital components) for predictive transportation scenarios (digital chronology)*

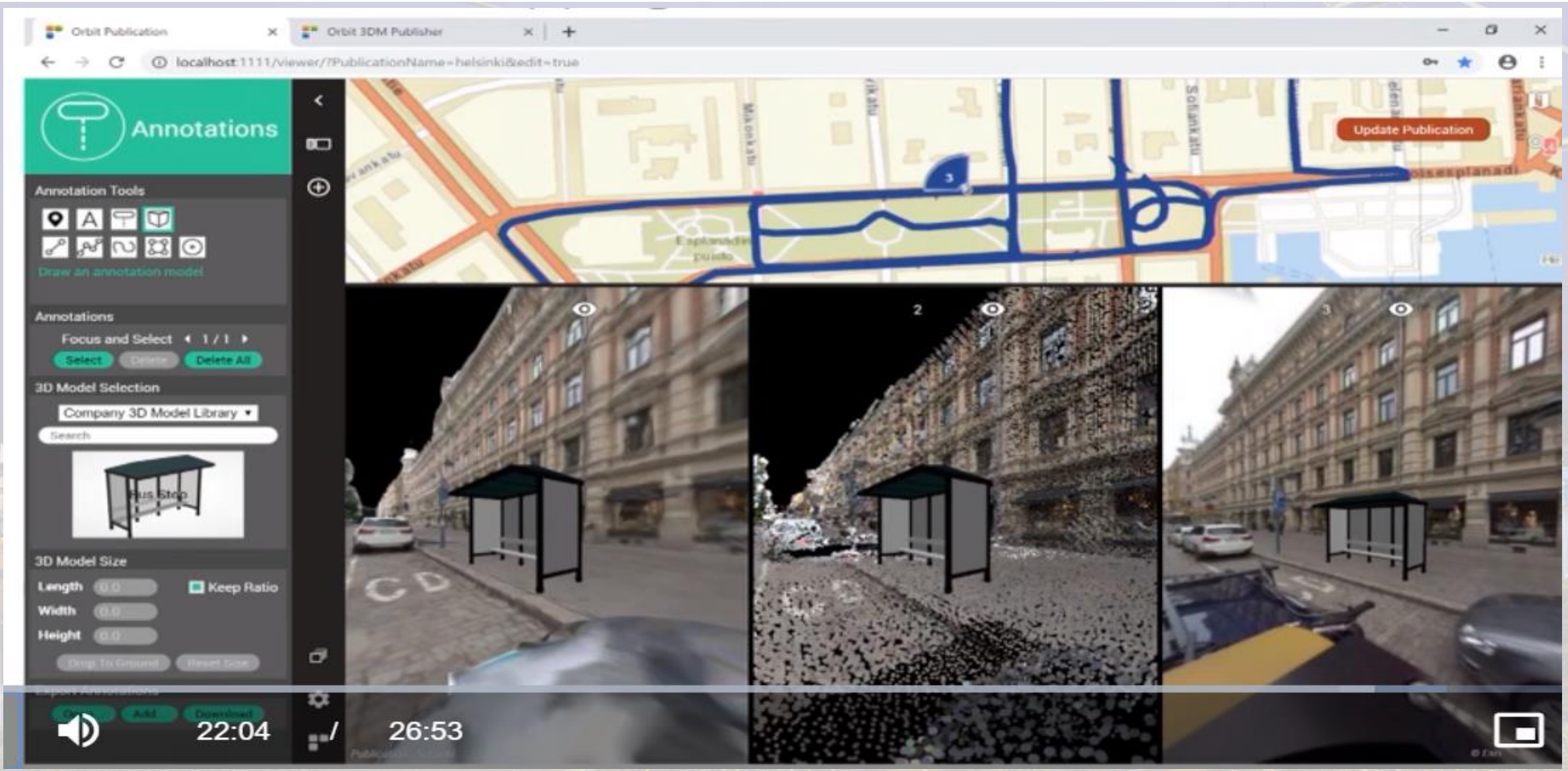
SINGAPORE – The *Year in Infrastructure 2019* Conference – 21 October 2019 – Bentley Systems, Incorporated, the leading global provider of comprehensive software and digital twin cloud services for advancing the design, construction, and operations of infrastructure, today announced the acquisitions of global mobility simulation (*CUBE*) and analytics (*Streetlytics*) software provider *Citilabs*, and global provider of 3D and mobile mapping software, *Orbit Geospatial Technologies (Orbit GT)*. The newly acquired technologies, in conjunction with Bentley's existing design integration and digital cities offerings, enable engineering-based mobility digital twins. Road mobility digital twins converge cities' digital context (including 4D surveying facilitated by Orbit GT for drone-and vehicle-mounted mobile mapping), and digital components (including from Bentley's *OpenRoads* engineering applications) with CUBE

Orbit GT: Mobile Mapping





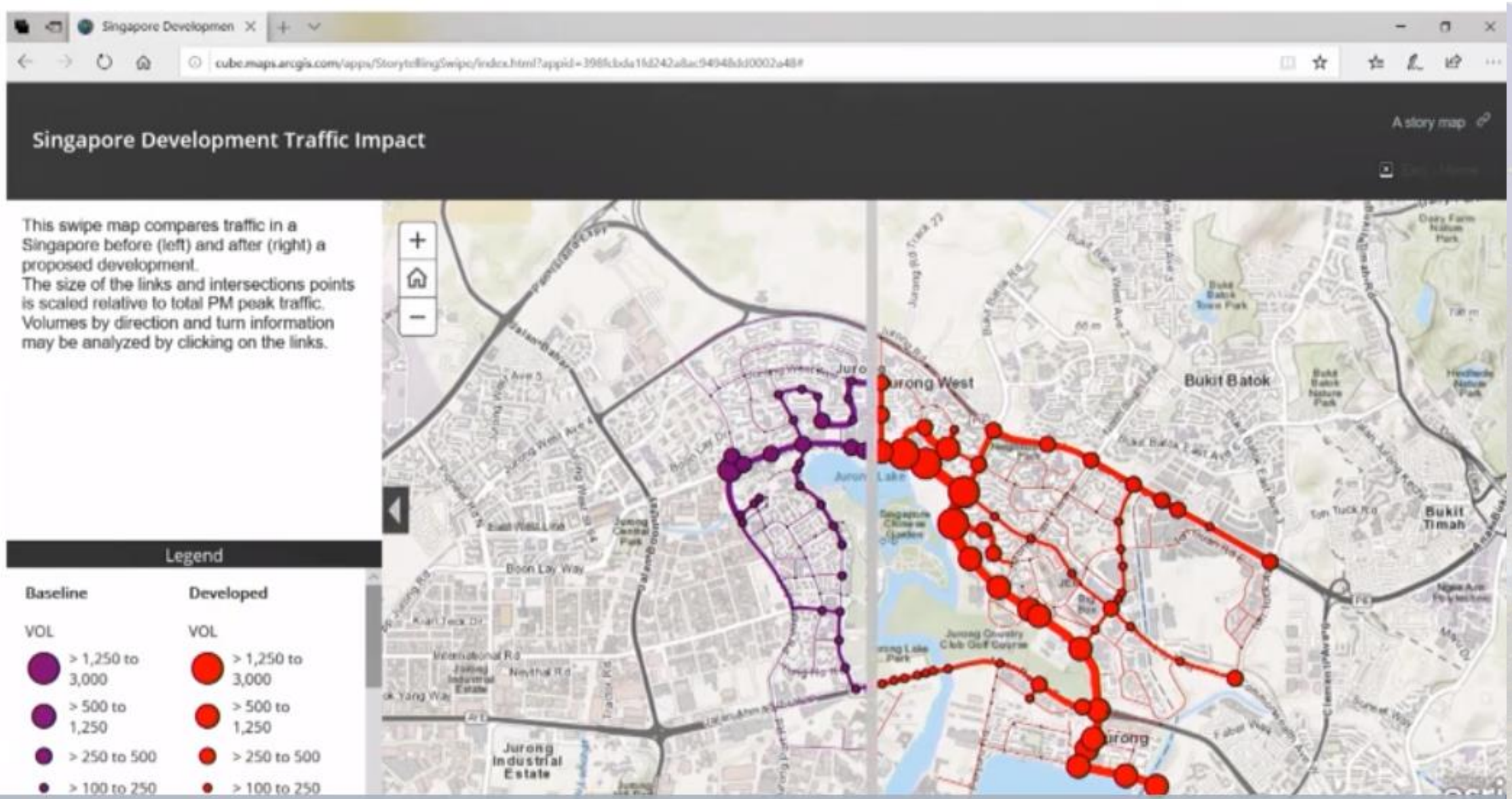
Orbit GT: Mobile Mapping



Aerial Photogrammetry only

Aerial Photogrammetry + Mobile Mapping

CitiLabs (CUBE): 4D GIS a and Traffic Simulation



Bentley /Advancing Infrastructure

TOPCON

News Release

Bentley Systems and Topcon Positioning Systems Launch their *Digital Construction Works* Joint Venture, to Close the Constructioneering Advancement Gap

New global company introduces digital integration services, advancing constructors' innovative digital workflows

SINGAPORE — The *Year in Infrastructure* Conference, October 21, 2019 — Bentley Systems, the leading global provider of comprehensive software and digital twin cloud services for advancing the design, construction, and operations of infrastructure, and Topcon Positioning Systems, a world leader in positioning technology for the survey and construction industries, today announced that its new, jointly owned company – *Digital Construction Works* – is open for business, with a full global staff of digital construction experts who have been contributed by Bentley Systems and Topcon, respectively. *Digital Construction Works* provides digital

Digital Construction Works

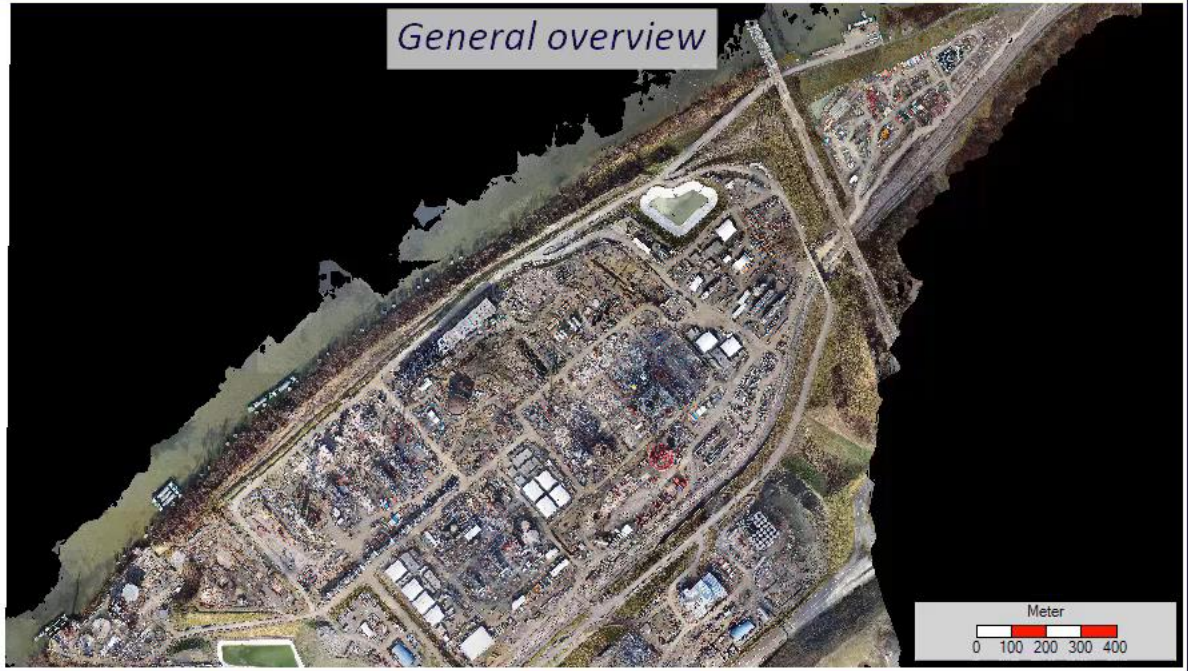
DIGITAL CONSTRUCTION WORKS

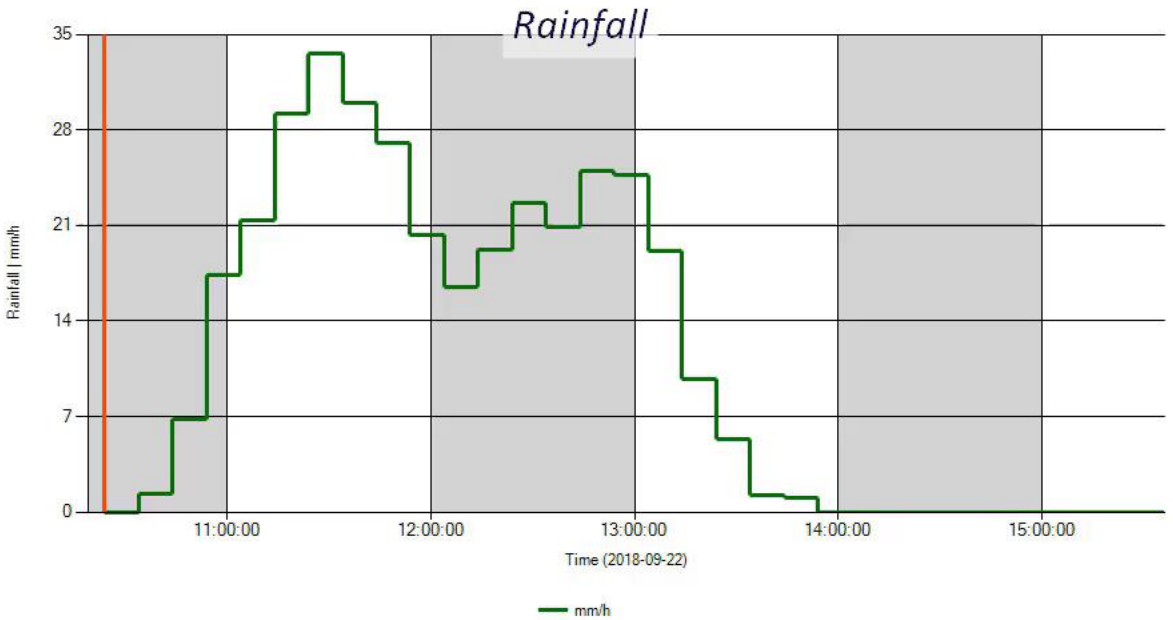
Digital Construction Works – the *Digital Integrator*

- Digital Construction Works delivers **end-to-end** digital integration services and technology solutions for construction operations
- Digital Construction Works and its extensive partner network can provide specialist resources and third-party technology. These services include, but are not limited to:

Solution Modules with Technology and Services

Advanced Work Packaging	Construction Modeling (4D/5D)	Digital Twinning	Realty Capture	Reality Modeling	Continuous Surveying	Visualization & Analysis
• Integrate project IT systems, people and processes to enable work packaging, constraint analysis, and analytics throughout the project lifecycle	• Define and continuously iterate upon the path of construction for constructability studies and field based visual progressing	• Use AI to augment the reality models with descriptive information such as: ownership, materials, maintenance data, cost, etc... The digital information platform for further planning and analysis.	• Through survey partners capture reality via sensors as baseline (LiDAR, aerial photos, terrestrial photos, etc.)	• Process the captured data and create reality mesh / 3D model	• Update and maintain digital twin through continuous surveying	• Workflows which consume the digital twin data using iTwin Services





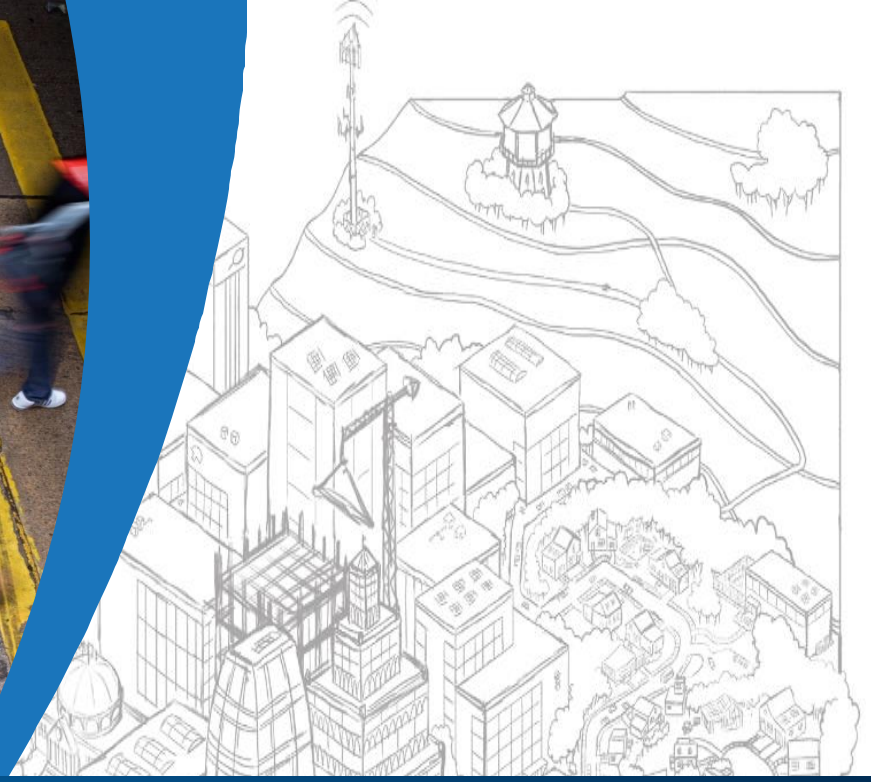
OpenFlows™ FLOOD™
CONNECT Edition

Rainfall/Infiltration/Runoff Modeling
- water depth -

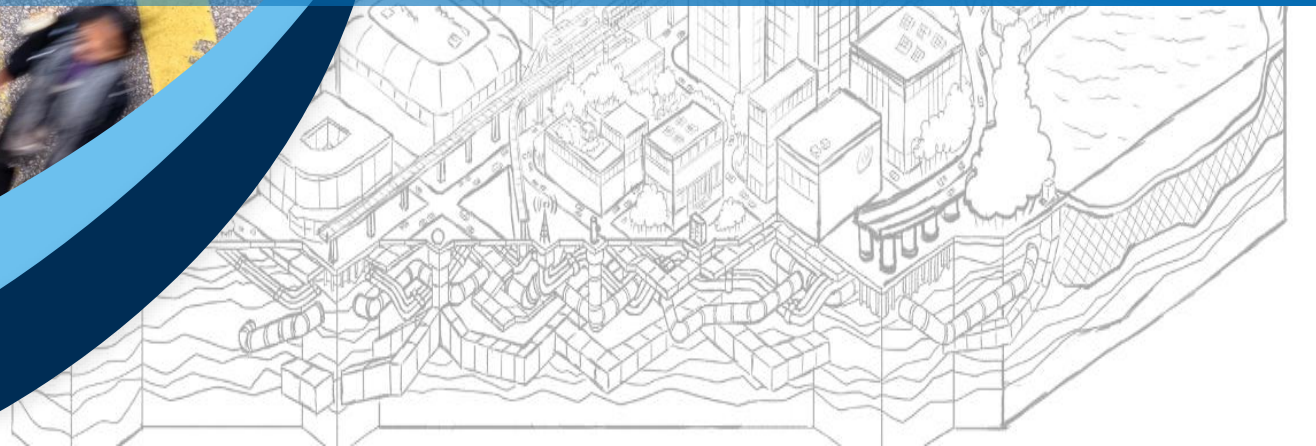

Current Mode:
Fly-thru
Look around
Fly fwd/back
Move
alt
Orbit
Tab
Toggle tools
F1
More
Exaggerated Scenario
AUTO

Digital Twins Applications

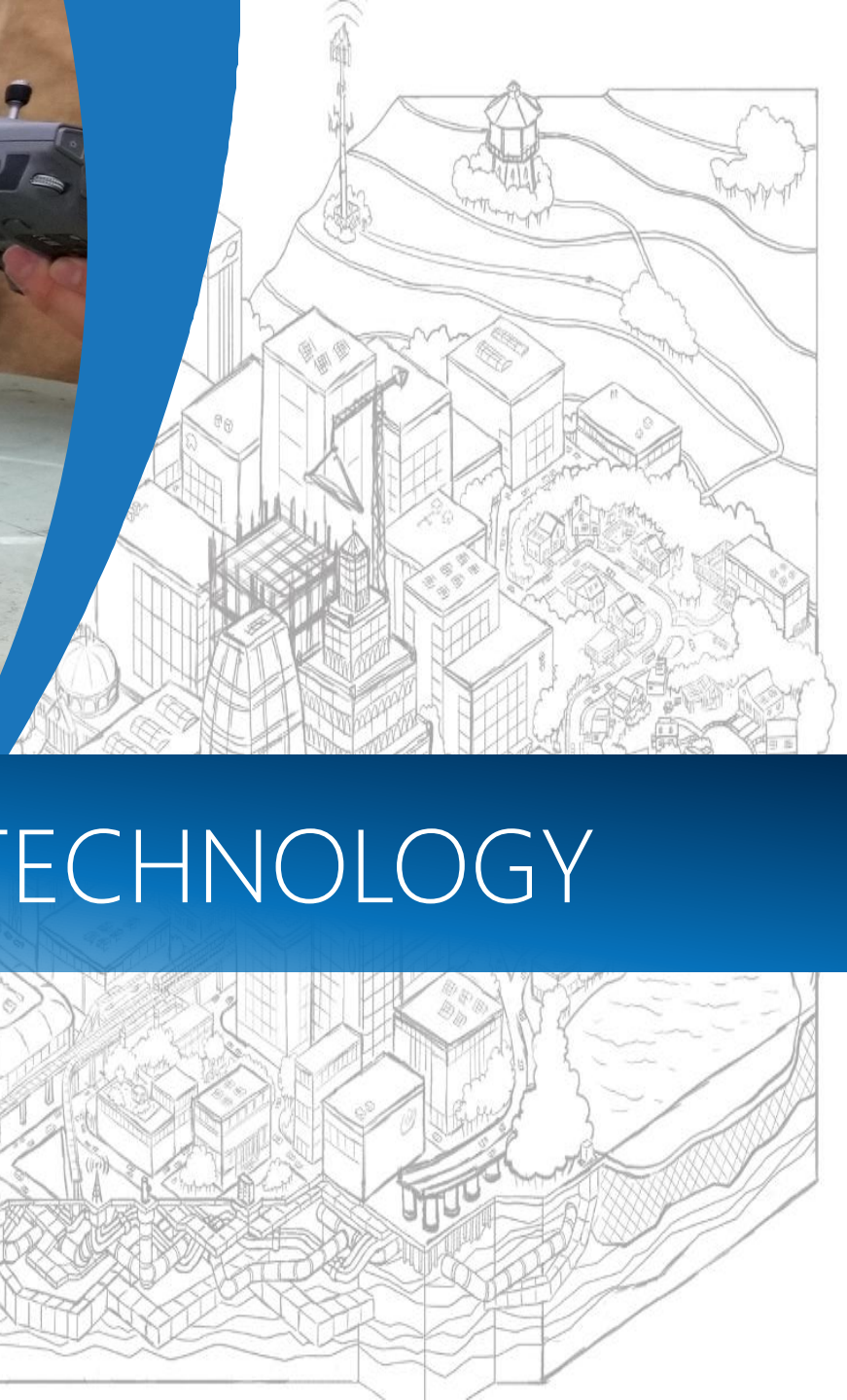
What is a digitally advanced city?



CONNECTED

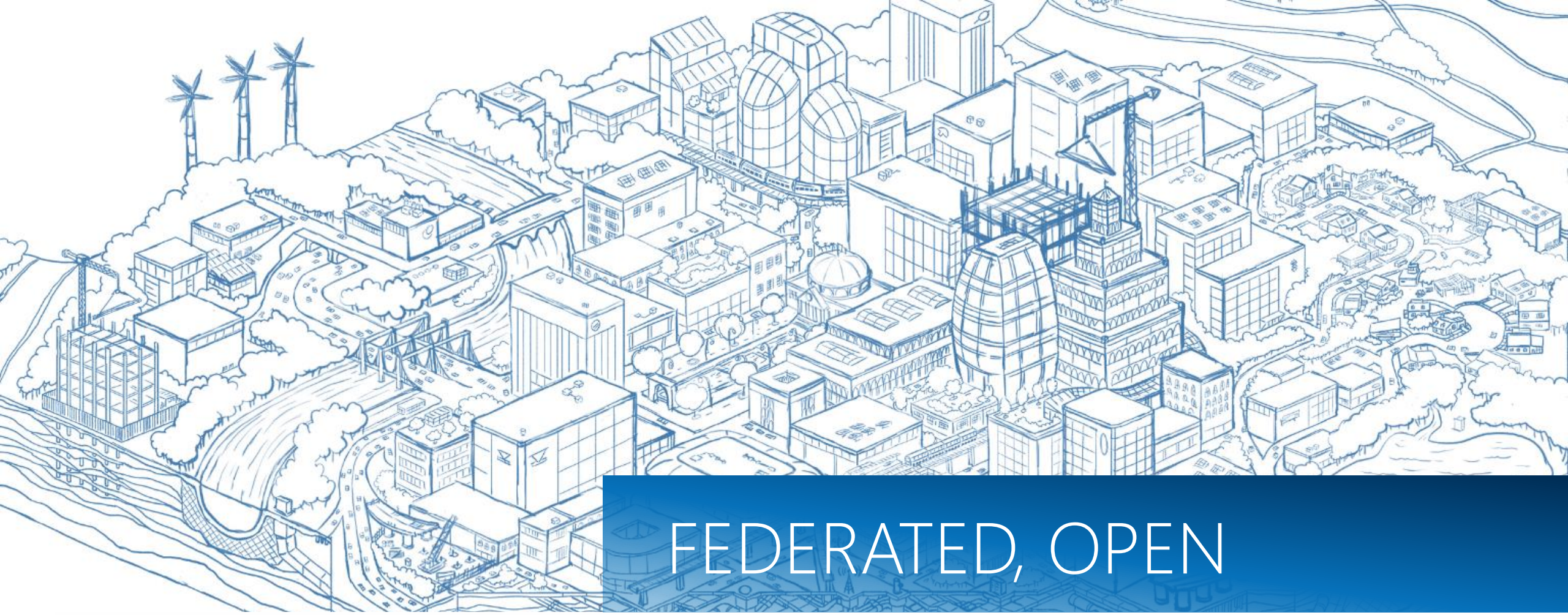


CONTINUOUSLY CHANGING



EMBRACE TECHNOLOGY

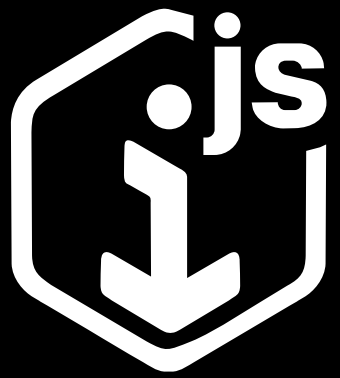
DATA INFORMED



FEDERATED, OPEN

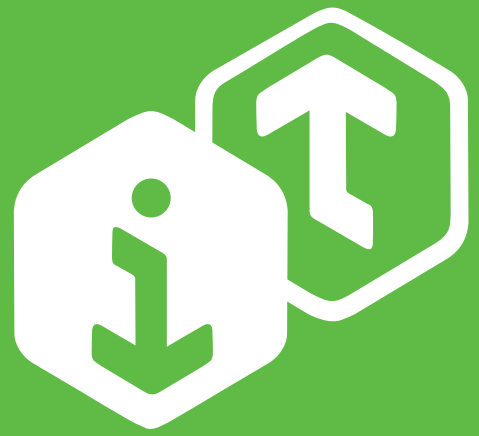

Operations/IoT Data
Engineering Data
Surveying and Mapping Data
3rd Party Infrastructure Data
3rd Party Developer Data
Emergency Services Data
Other Data

Federated data sources



iModel.js

Create Immersive
Connections with your
Infrastructure Digital Twin

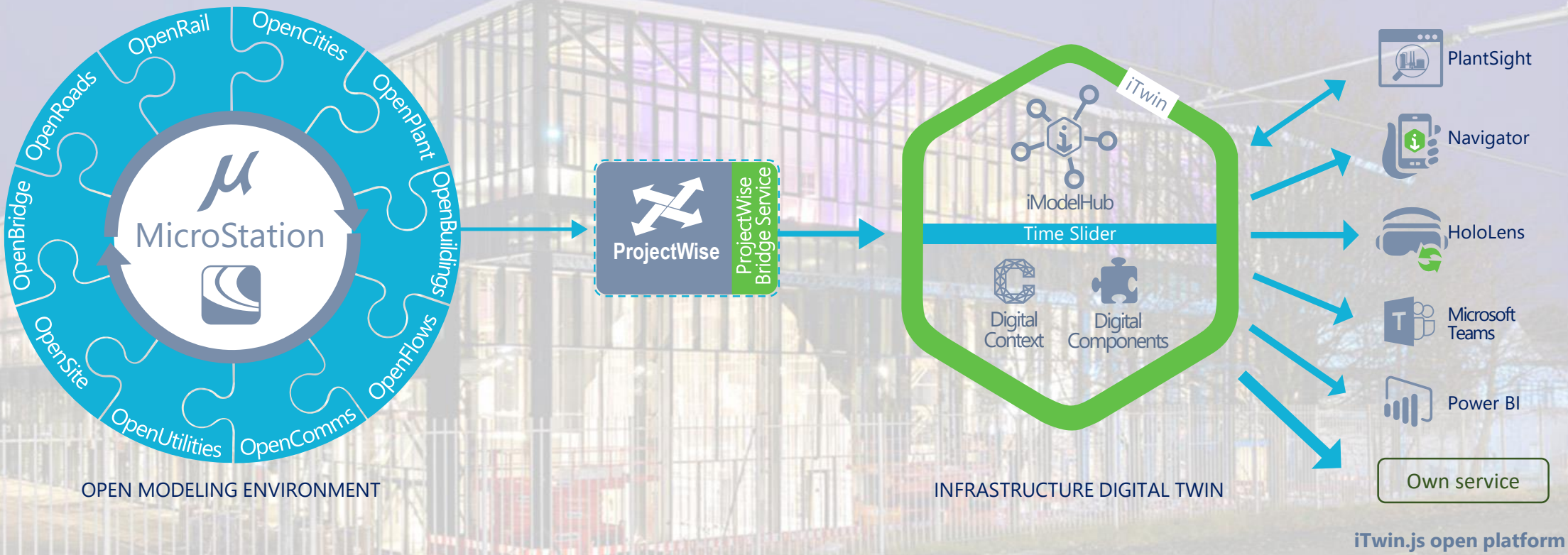


iTwin Services

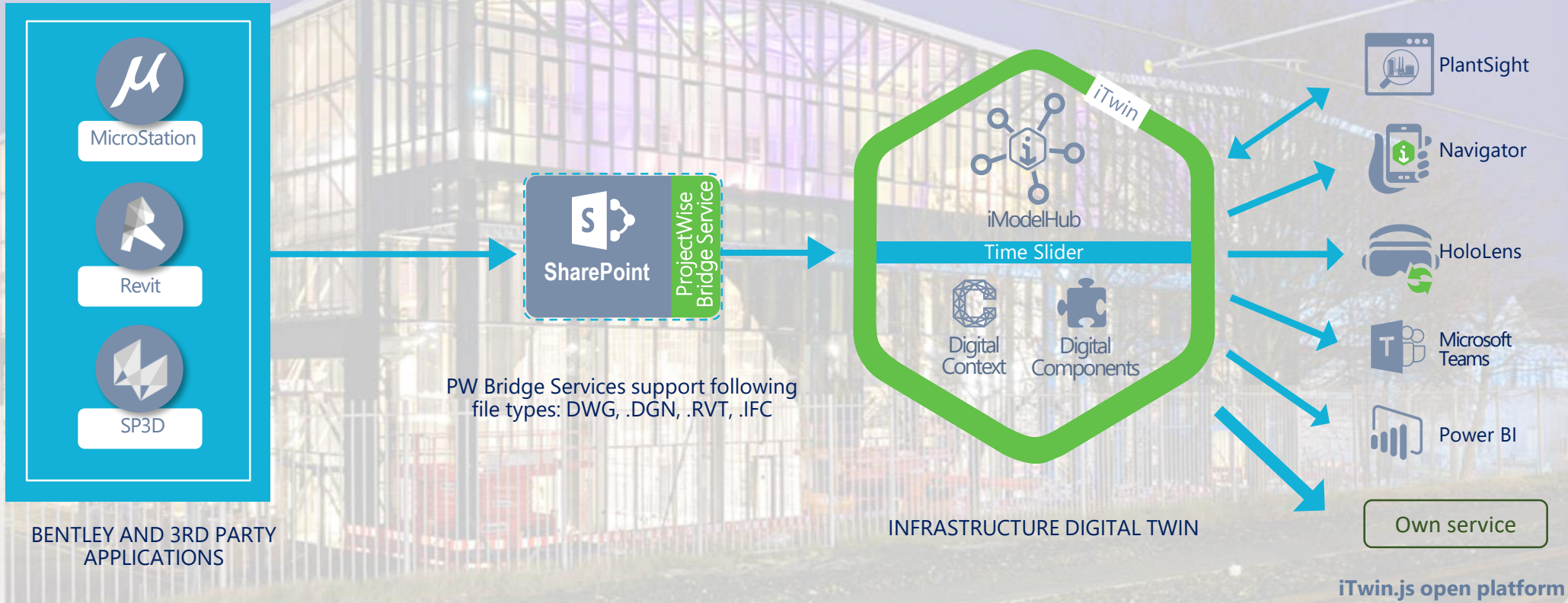
Immersive
Connections for an
Open Ecosystem

Bentley

An iTwin is an Infrastructure Digital Twin



An iTwin Federates/Imports Models from Multi-vendor



ProjectWise Explorer

Datasource Folder Document Export View Tools Window Help

Search | Interface Manager

Address pw:\\PC-PWISU2.bentley.com:pc-YII_2017\Documents\BARTA\BARTA Projects\BSI 100 West Station\Building\S | Go

- Marketing
- naou-tli
- NAOUAE
- PC-U2Geo
- PRG
- ProductDesign
- Project Delivery Advancement Team
- Project Delivery Americas
- PW-test1
- PWCS Catalog Data
- Reg-Sales-NAOU
- RSO Global
- Sales-ProjectDelivery
- Sales Infrastructure Owners
- TSG
- User-Advocacy-Team
- YII_2017 (BENTLEY\Buddy.Branham)
  - Documents
    - Application Data
    - BARTA
      - BARTA Projects
        - BSI 100 West Station
          - _WorksetStandards
          - Bridge
          - Building
            - Package
            - Retail Archtecture
            - Stuctural
              - 2D Model
              - 2D Sheets
              - 3D Model
                - Design Insights
                - Update 2
                - Update 3
            - Civil Site
            - Photos
            - Rail
            - Reality Model
            - Train Station
            - Saved Searches
        - BSI200 - Peterborough Geospatial Investigation
        - BSI300 - Medical Complex-Córdoba
        - BSI400 - W01 - Intersection of I-9 and SR 32
        - BSI900 - Adelaide Tower
        - Gas Authority, Inc
        - Wedraw Drafters, Inc - New Employee Training
      - Planning
    - Demo1
    - dmsSystem
    - Geospatial Map
    - Projects

Name	PW_CODE	PW_DESCRIPTI...	PW_FILTER	PW_FILTER2	PW_SORT...
Design Insights					
Update 2					
Update 3					
04 Masterl Oakland west Station.i.dgn					
Architectural Oakland west Station RVT_04.i.dgn					
E-Second_Floor.dgn					
Master Structural Oakland west Station_04.dgn					
Oakland West Bart LR Station.dgn					
S-First_Floor.dgn					
S-Ground_Floor.dgn					
S-Roof.dgn					
S-Second_Floor.dgn					

Project Properties | Folder Properties | Project Portal | Dependency Viewer | Access Control

Properties (Project Type - Civil)	
Project Number	BSI500
Project Name	West Station LR Expantion
Owner	California Department of Transportation
Project Description	Replace existing Platform with joint commuter / Light rail with retail
Route	West Line
Station-Start	
Station-End	
Project Length	2400 ft
Project Location	Alameda County, CA
Country	United States
Budget	3500000
Start Date	6/1/2017
End Date	9/28/2018
General Contractor	Robbins Railway Construction
Project Manager	Bill Bailey
PM Phone Number	(530)865-00002
Project Status	Design
Percent Complete	30
Home Folder Properties	
Folder Name	BSI 100 West Station
Folder Description	West Station

Transferred 7 files in 0:14, 0 bytes total

9:31 AM

ACCOUNTABILITY

ProjectWise

BSI 100 West Station

Project Details

Registered:	Thursday, August 31, 2017
Modified:	Friday, September 15, 2017
Industry:	Rail and Transit
Asset Type:	Stations and Platforms
Latitude:	37.804139°
Longitude:	-122.293271°
Time Zone:	Singapore Standard Time
Data Center Location:	East US

ProjectWise Connections	0
ContextShare Connection	
SharePoint Connections	0

Edit Project Details

Team Members

- AB Abeesh Basheer
- AM Adam McCarthy
- AG Akshay Govekar
- AN Alexander Nikitin
- AK Alexey Krylov

Manage Members

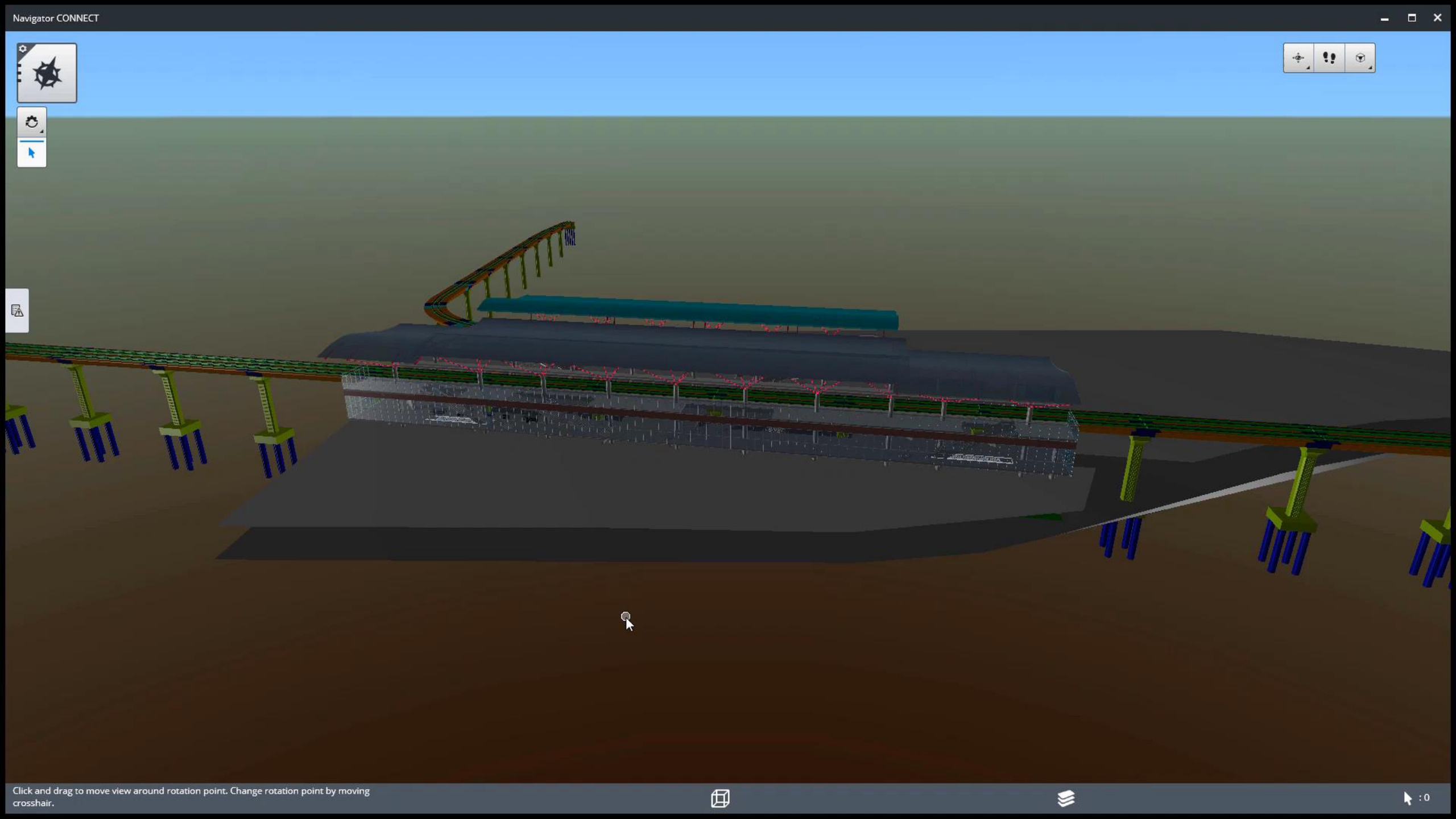
Notifications

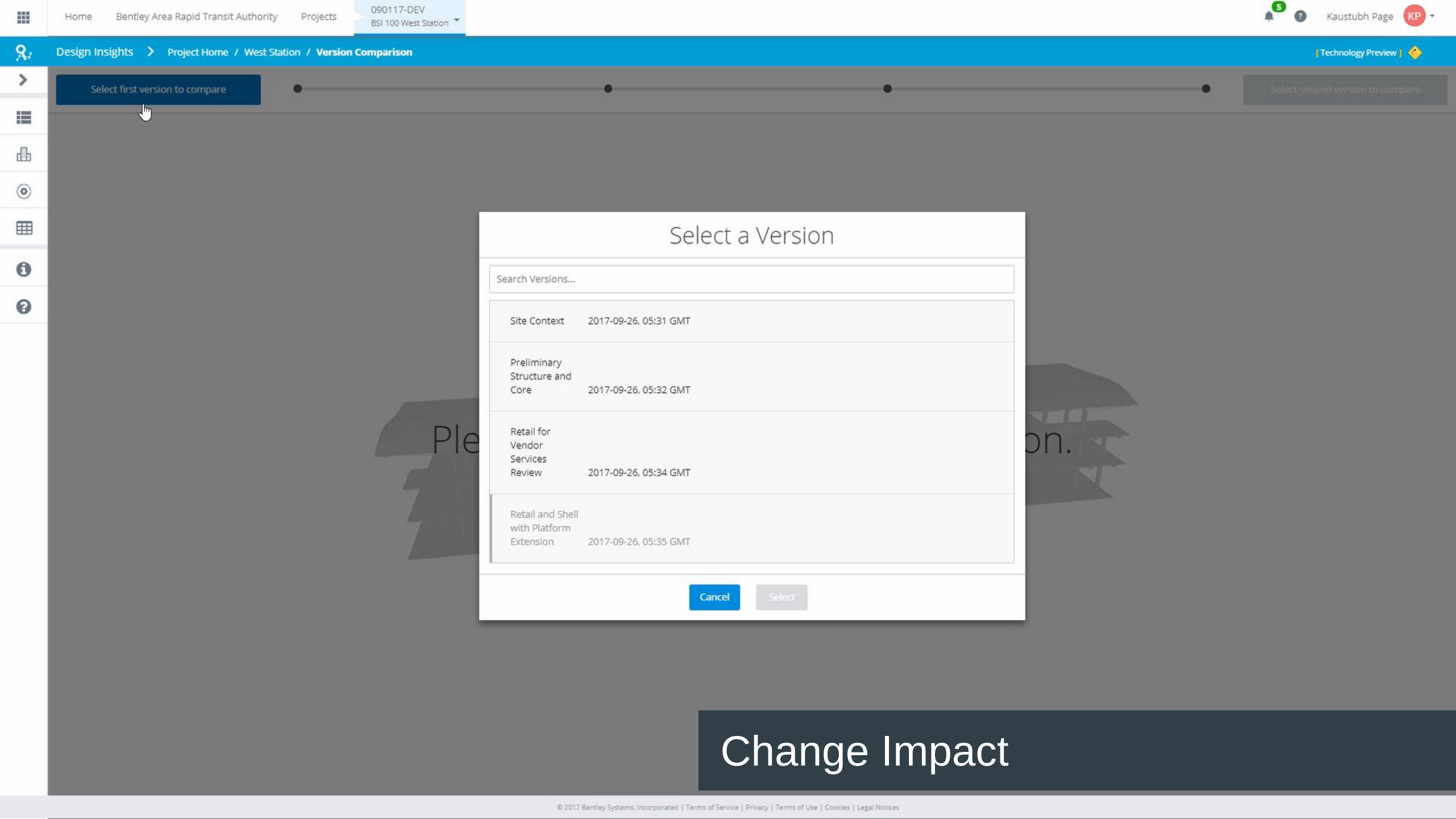
No notifications

ProjectWise Connection Services

- Share
- Deliverables Management
- Performance Dashboards
- Issue Resolution
- Field Data Management
- Project Synchronization

iTwin Services


Navigator CONNECT
Click and drag to move view around rotation point. Change rotation point by moving crosshair.
: 0


Home
Bentley Area Rapid Transit Authority
Projects
090117-DEV
BSI 100 West Station
Kaustubh Page
KP
Design Insights
Project Home / West Station / Version Comparison
[Technology Preview]
Select first version to compare
Select second version to compare
Select a Version
Search Versions...
Site Context 2017-09-26, 05:31 GMT
Preliminary Structure and Core 2017-09-26, 05:32 GMT
Retail for Vendor Services Review 2017-09-26, 05:34 GMT
Retail and Shell with Platform Extension 2017-09-26, 05:35 GMT
Cancel
Select
Change Impact
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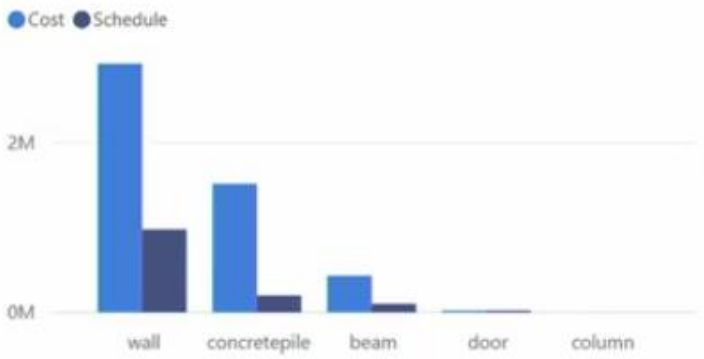
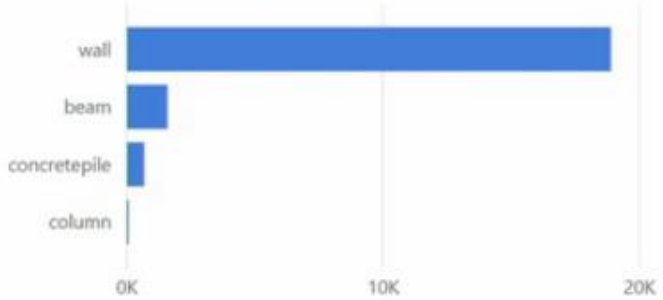
Please select versions for comparison.

Change Heatmap

Design Element Cost & Schedule

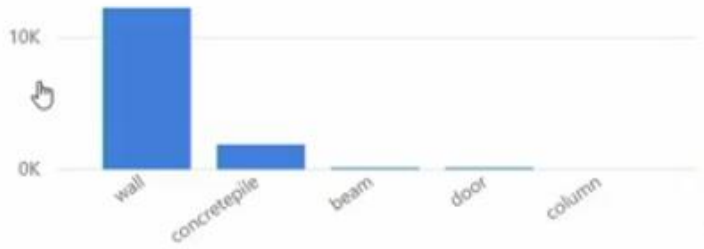


Design Element Distribution by Volume

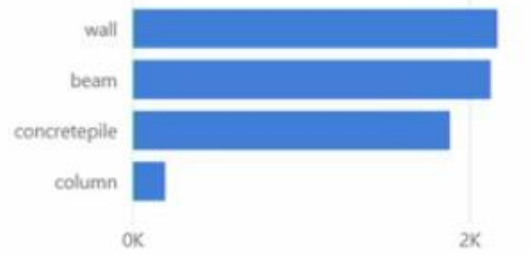


Material Assignment

Design Element Safety Index



Design Element Distribution by Length

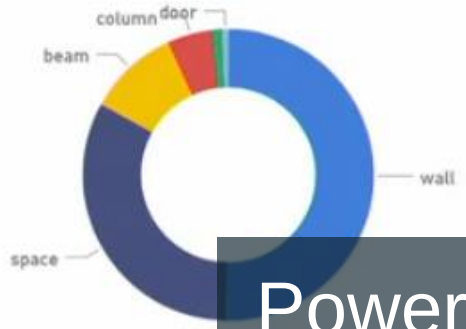


Section Variety

Volume Anomalies

element	area	length	Model	Calculated
beam	63.53	2,122.72	1,536.13	1,585.05
column	0.60	191.31	0.00	3.62
concretepile		1,881.31	671.94	671.94
wall		2,163.69	17,662.60	18,894.37
Total	**64.13**	**6,359.03**	**19,870.67**	**21,154.98**

Design Anomalies



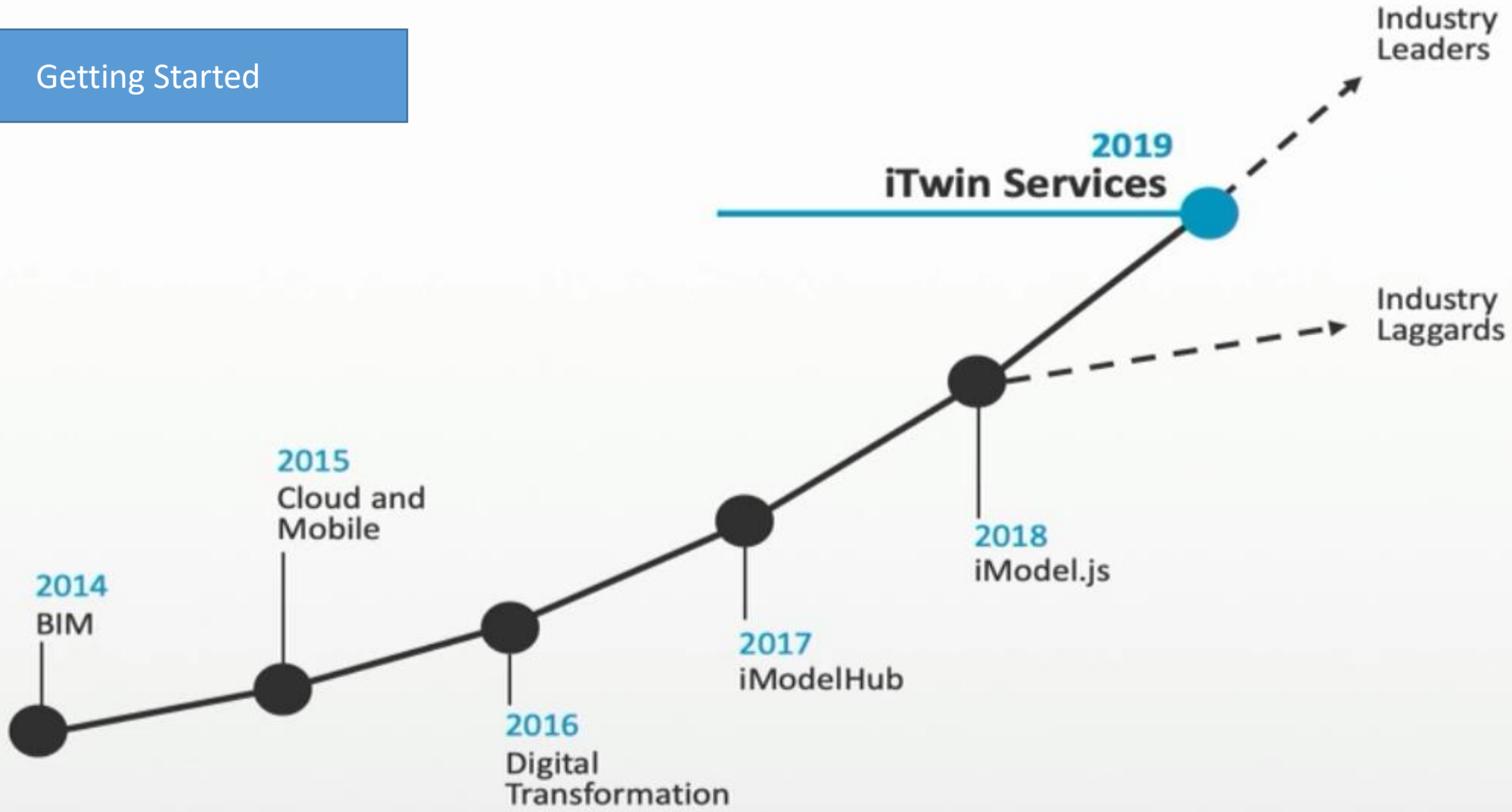
Section Variety

element	section	Count of section
beam	1000x1500	20
beam	1220x16	23
beam	1500x1000	2
beam	1500x1500	6
beam	3000X1500	1
	900 X 400	14
Total		361

Power Bi dashboard

Takeaway Message: Digital Twins are real and now!

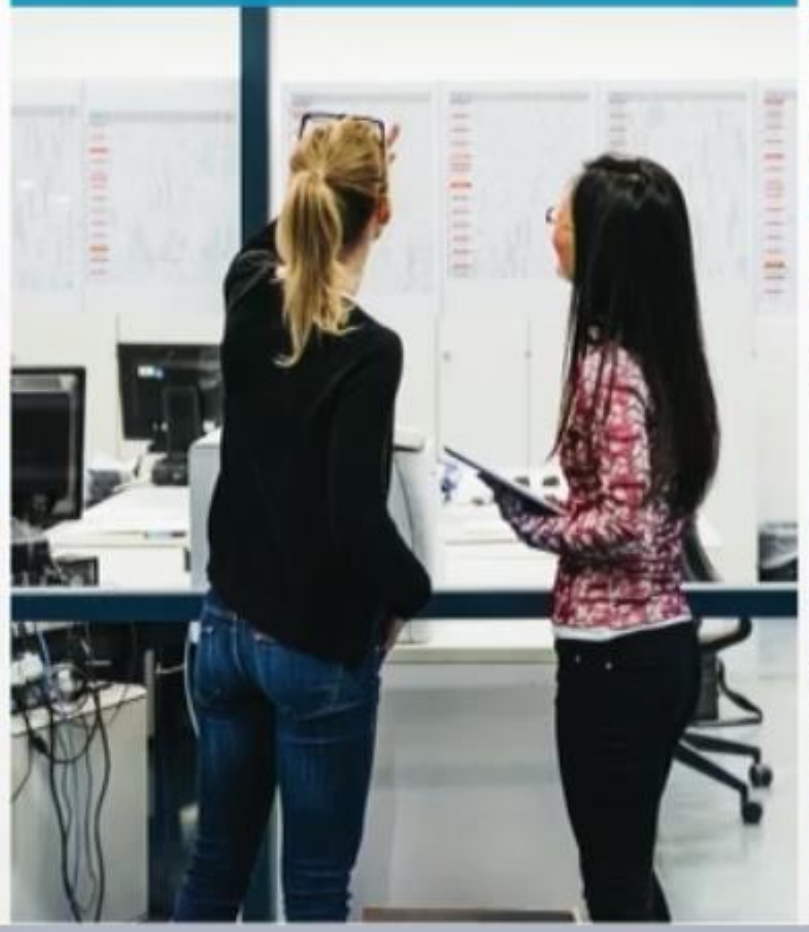
Getting Started



Your "Digital Twin Execution Plan"

Strategy

Tactics



Agility

Bentley.com/iTwin

Get started with iTwins

It can be challenging when the data you need for digital twins is in incompatible formats and different data sources from different vendors. It really shouldn't be that hard to create, visualize and analyze digital twins.

iTwins make it simple.