

# *Going Digital:* Reality Modeling Advances *Surveying*, and Engineering...

Greg Bentley, CEO, Bentley Systems



May 30, 2017

**Bentley**<sup>®</sup>  
Advancing Infrastructure





*Going Digital:*  
**Reality** Modeling Advances *Surveying*, and Engineering...

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*Going Digital:*  
Reality **Modeling** Advances *Surveying*, and **Engineering**...

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Advancing Infrastructure



# Bentley®

*Advancing* Infrastructure





# Advancing Infrastructure...



**Bentley**  
**Institute**





*Going Digital:*  
**Reality Modeling Advances Surveying, and Engineering...**



May 30, 2017

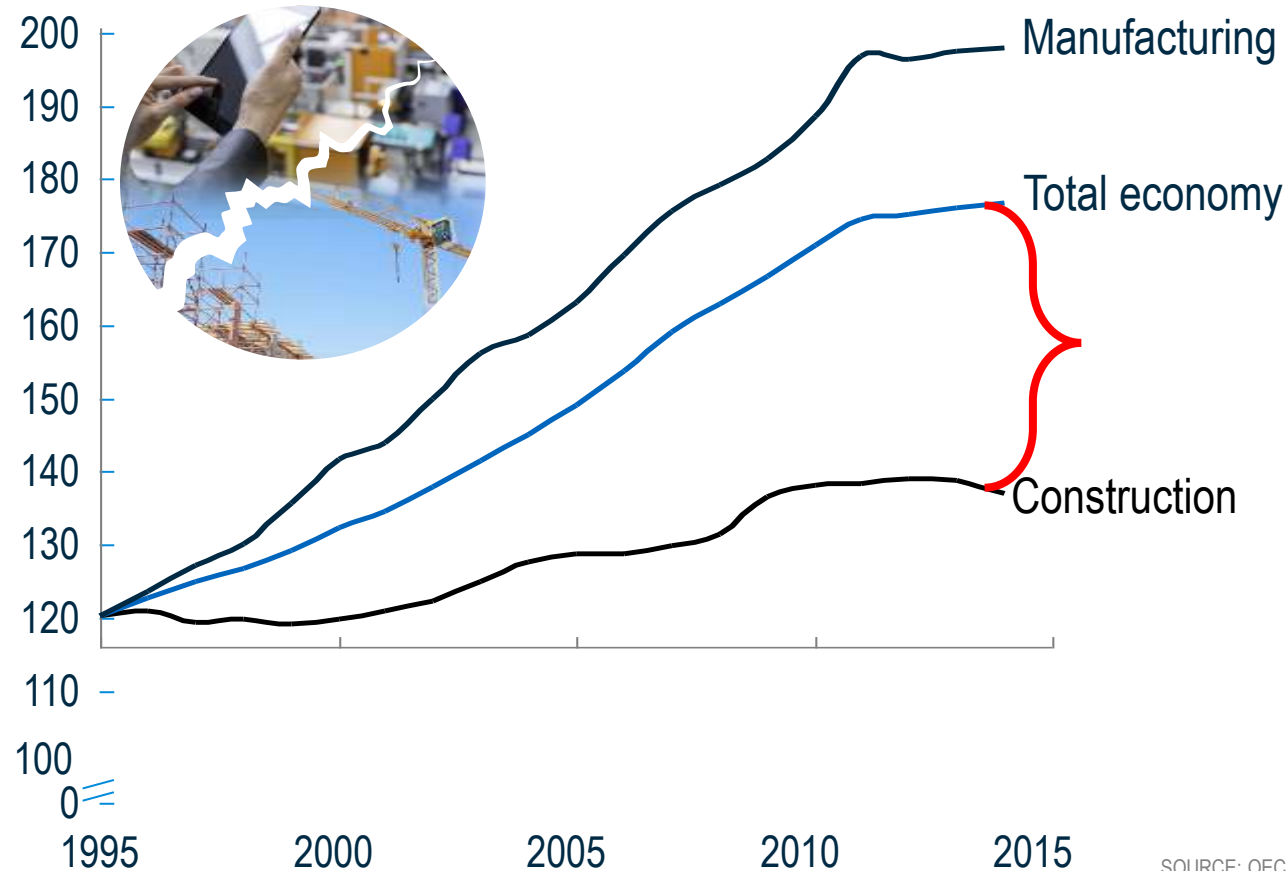
**Bentley**<sup>®</sup>  
Advancing Infrastructure



# Construction constitutes 13% of Global GDP but productivity growth remains dramatically low



**Source:**  
**Imagining Construction's Digital Future**  
 Capital Projects and Infrastructure  
 June, 2016  
 McKinsey Productivity Sciences Center, Singapore



1 Real (2005 USD) gross value added per hour worked by persons engaged, indexed 1995 = 100, 20-year CAGR

SOURCE: OECD, WIOD, GGCD-10, WorldBank, US BEA/BLS, Turkish National Statistics Bureau, Singapore National Statistics Agency, Malaysian Statistics Agency, Rosstat, McKinsey Global Institute Analysis, Global Insight; ISSA

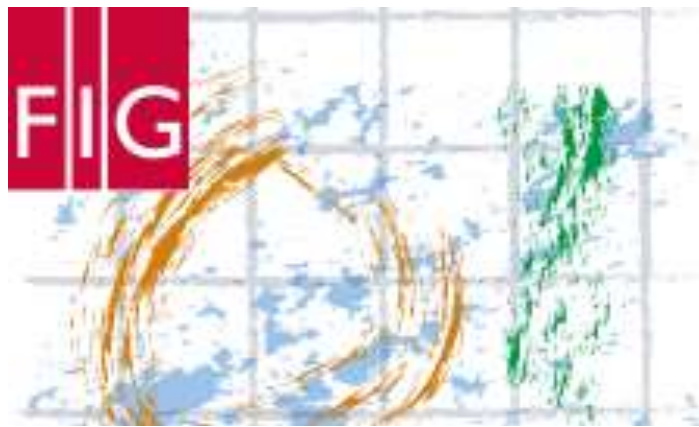




Source:  
**Imagining Construction's Digital Future**  
 Capital Projects and Infrastructure  
 June, 2016  
 McKinsey Productivity Sciences  
 Center, Singapore



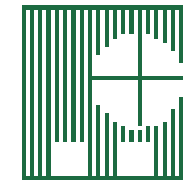




# FIG WORKING WEEK 2017

Surveying the world of tomorrow –  
From digitalisation to augmented reality

May 29 - June 2 Helsinki Finland





# “Engineering Design Tools for Plants and Infrastructure”







- #1 *Water and Wastewater Distribution*  Bentley®
- #1 *Electric Transmission & Distribution, and Communications Systems*  Bentley®
- #2 *Power Generation*  Bentley®
- #2 *Software as a Service*  Bentley®
- #2 *Engineering Design Tools for Plants and Infrastructure*  Bentley®



## “*Asset Reliability Software and Services*”



- #1 *Reliability Software for Water and Wastewater*  Bentley®
- #1 *Reliability Software for Electric Power T&D*  Bentley®
- #1 *Reliability Software for Other Industries*  Bentley®
- #2 *Reliability Software Revenue*  Bentley®



# ARC Global Market Research Study, August, 2016

## **“Geographic Information Systems”**



#2

*Geographic Information Systems (GIS)*  **Bentley®**

#1

*Software as a Service*  **Bentley®**





UPCOMING SUMMIT

**Singapore: May 24-26, 2017**

New Solutions for Global Infrastructure

### **BUILD: THE FUTURE OF CONSTRUCTION**

Proven management processes and innovative technology-enabled solutions—from drones to next-generation building-information modeling, digitization, and advanced data analytics—have the potential to boost construction productivity by 20 to 25 percent and increase profitability. What are the most tangible proven solutions to improve the outcomes and economics? How are leading companies overcoming the obstacles of fragmentation, cultural resistance, and risk aversion?

#### *Panelists*

**Greg Bentley**, Chief Executive Officer, Bentley Systems

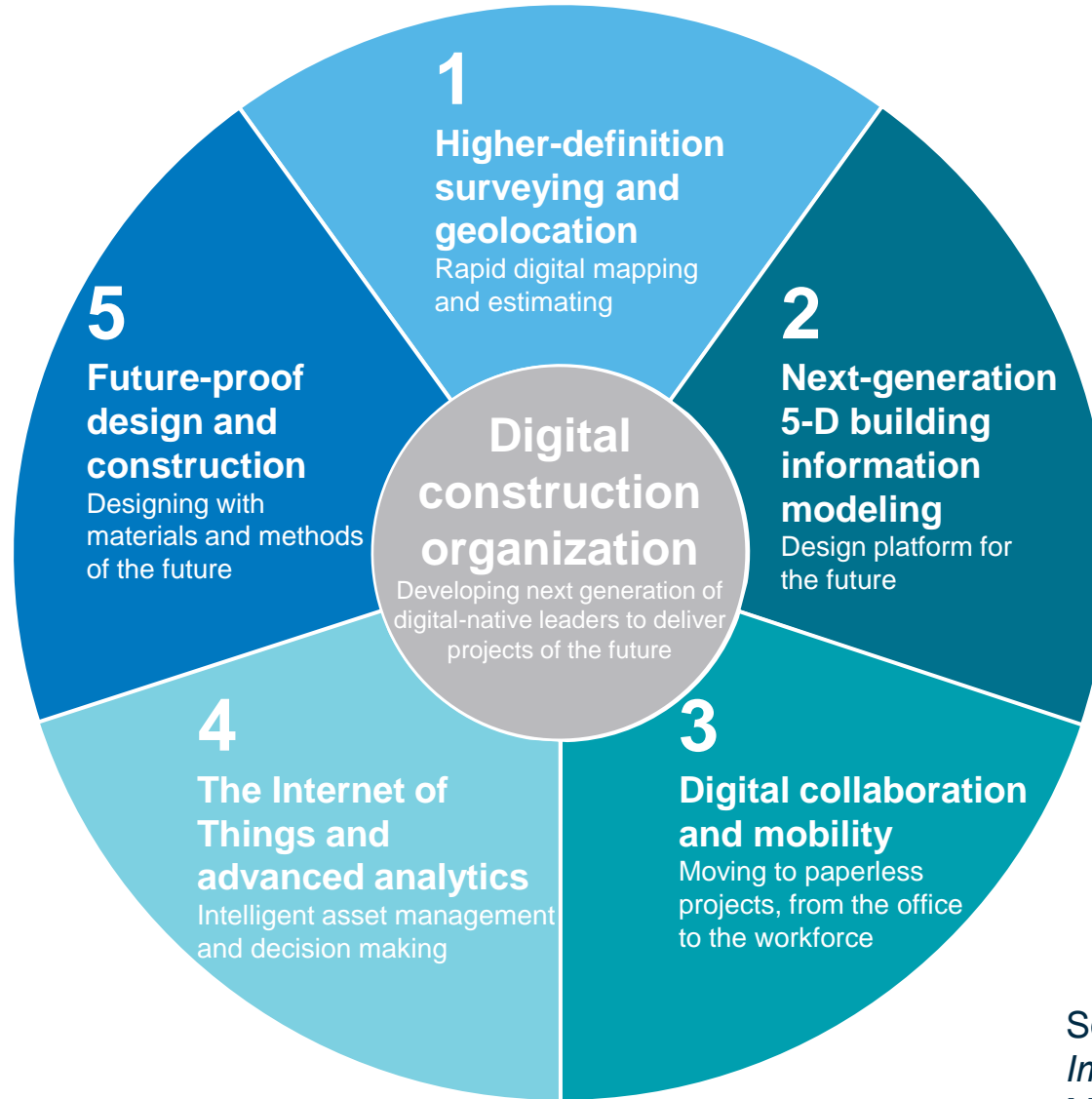
**Isabel Dedring**, Global Transport Leader, Arup

**Shaun Kenny**, President, Asia Pacific, Bechtel

*Moderator:* **Michael Della Rocca**, Partner, McKinsey & Company



# Going Digital: Reality Modeling...



Source:  
*Imagining Construction's Digital Future*  
McKinsey, June, 2016



# Reality Modeling (2015)...







News Release  
Press Contact:  
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+1 610 321 6493  
[ron.kuhfeld@bentley.com](mailto:ron.kuhfeld@bentley.com)  
Follow us on Twitter  
[@BentleySystems](https://twitter.com/BentleySystems)

## Leica Geosystems Selects Bentley's *Acute3D* Reality Modeling Software to Further Enhance Its Airborne Imaging Solutions

*Solutions for Both Unmanned Aerial Vehicles and Piloted Aircraft to Benefit from Acute3D's Reality Mesh Representations*

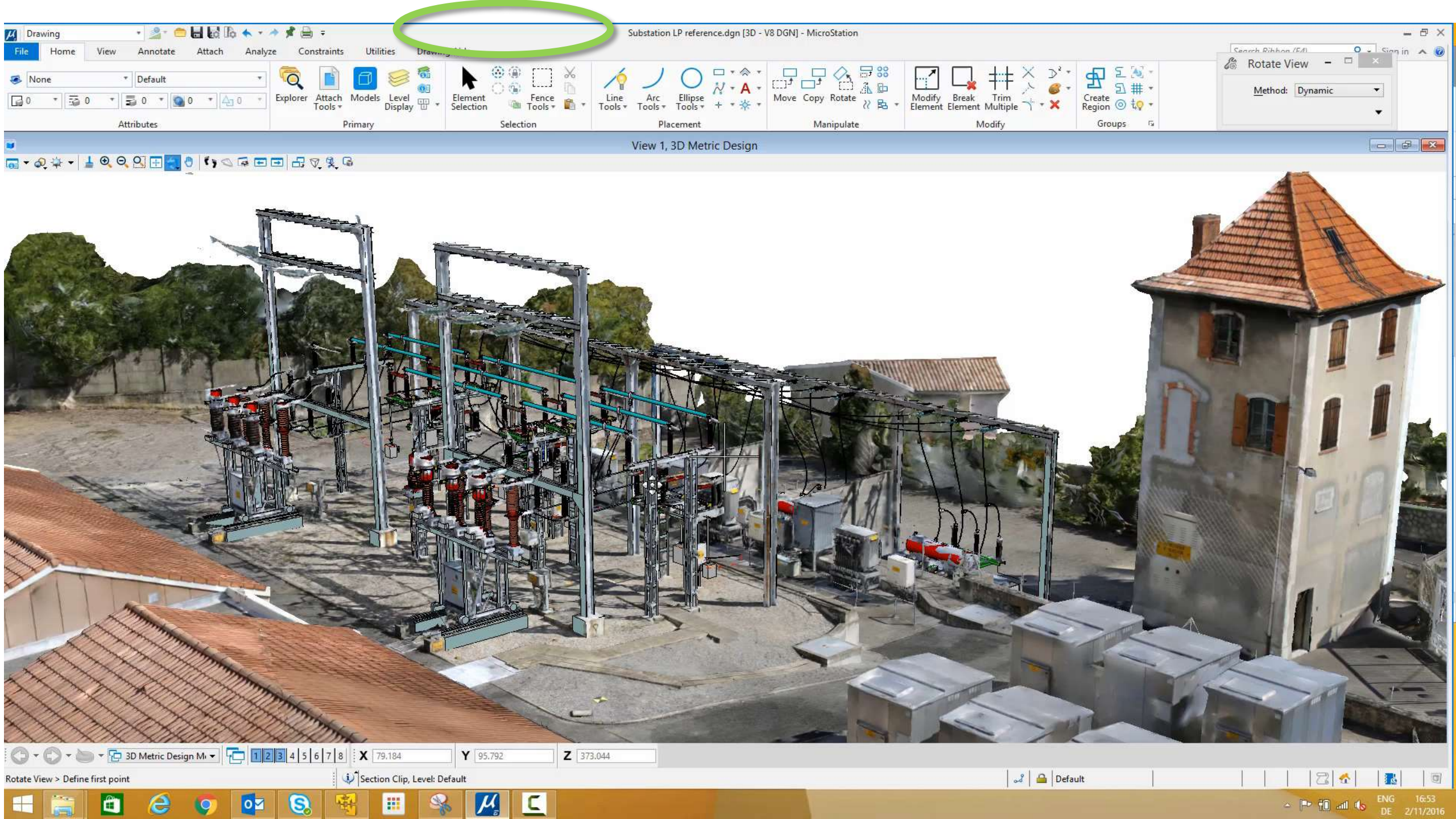
EXTON, Pa. U.S.A. – October 7, 2015 – Bentley Systems, Incorporated, the leading company dedicated to providing comprehensive software solutions for *sustaining infrastructure*, today announced that Leica Geosystems will incorporate Bentley's *Acute3D* reality modeling software into its advanced oblique airborne imaging solutions for both unmanned aerial vehicles (UAVs) and piloted aircraft. Leica Geosystems, a leader in geospatial data acquisition and mapping products, has selected *Acute3D* software to generate full 3D “reality mesh” representations from its airborne photogrammetric imagery. This combination of software and hardware advancements will enable users to take full advantage of integrated 3D surveying and mapping.



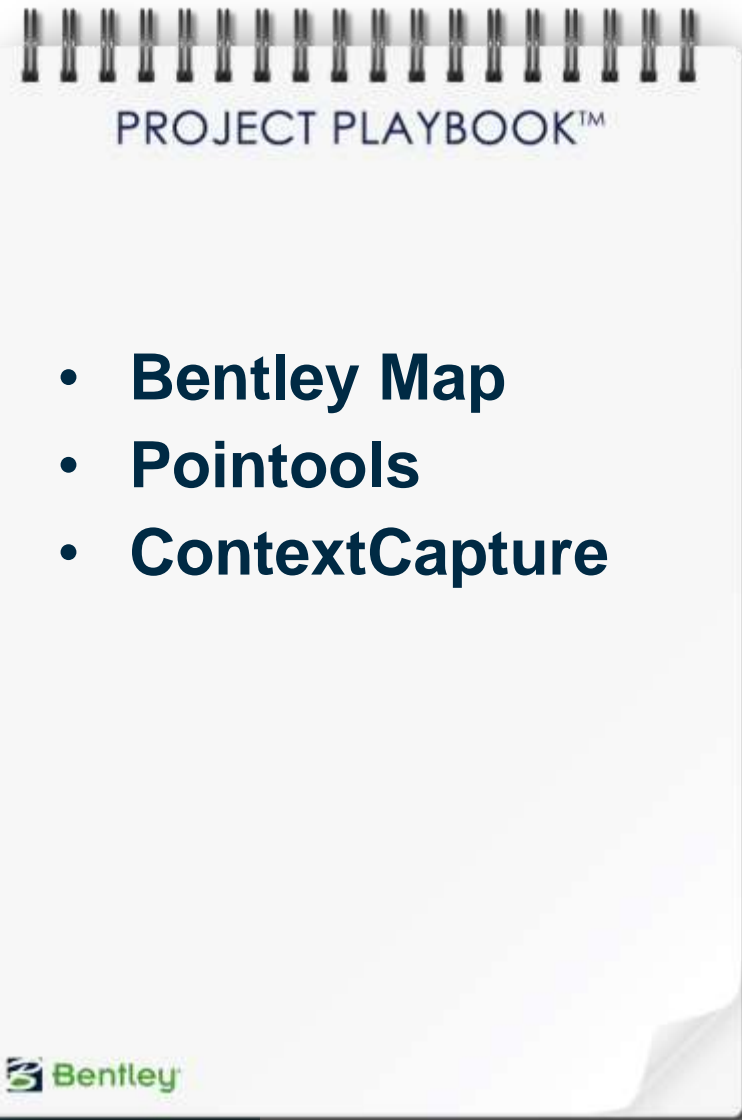
286 images from UAV











2015 *Be Inspired* **Winner:**  
Reality Modeling

Singapore Land Authority  
Mapping Singapore in 3D





THE  
**YEAR IN INFRASTRUCTURE 2015**  
CONFERENCE



## Mapping Singapore in 3D

Victor KHOO & Kean Huat SOON

Singapore Land Authority



# Creating Space Above and Below



Industry Space Above Roads



Underground Science City

(Source: JTC)



## GOING UNDERGROUND

Singapore has many different types of rocks under its surface, from granite and norite, which are much harder than concrete, to limestone, which could be dissolved by rainwater. Here are some of the rock formations and a snapshot of Singapore's underground projects.



Jurong Rock Caverns

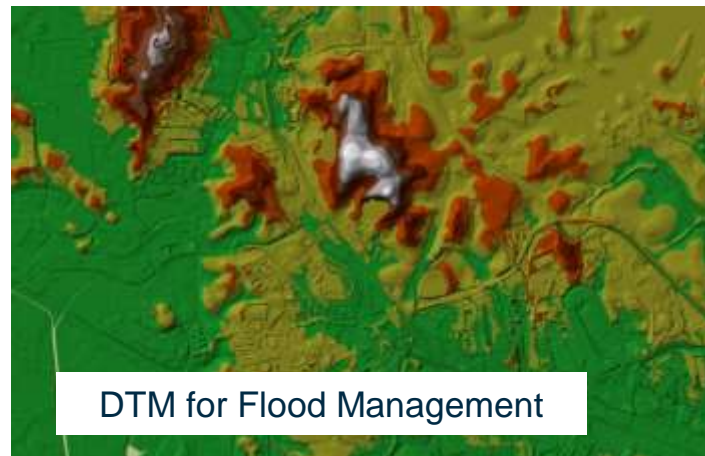
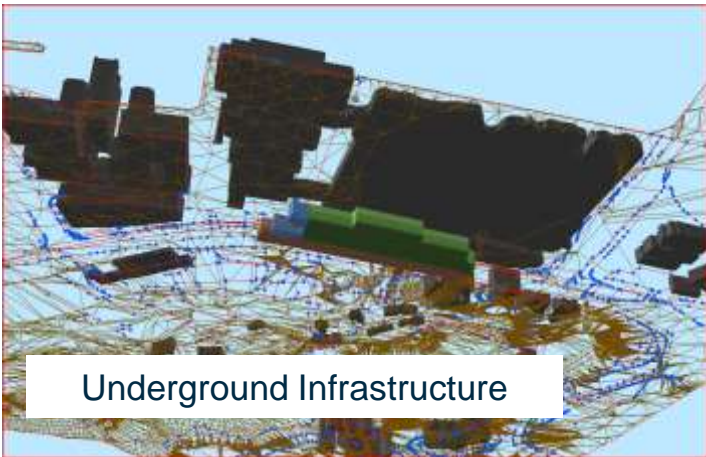
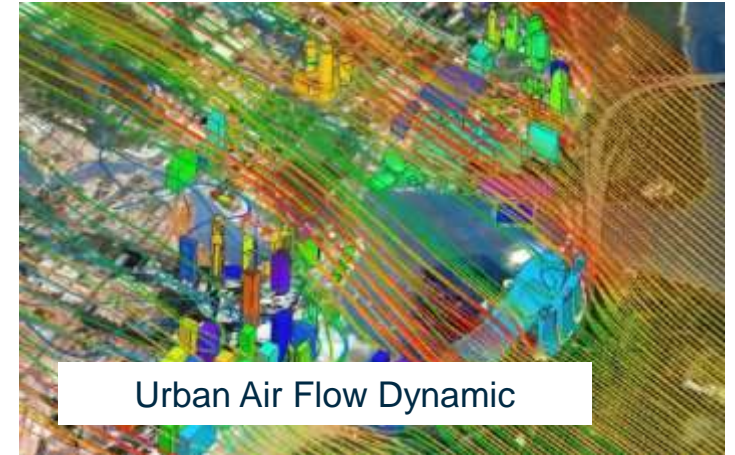
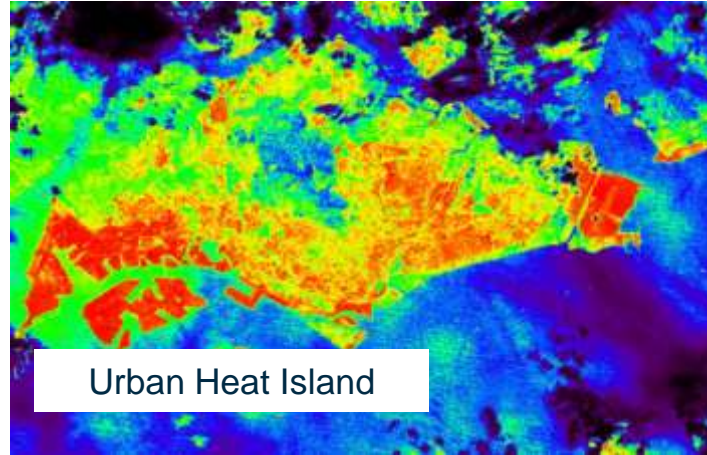


# CityGML Model in Bentley Map Enterprise





# 3D Map Data – Needs are Growing



# 3D Mapping for Smart Nation



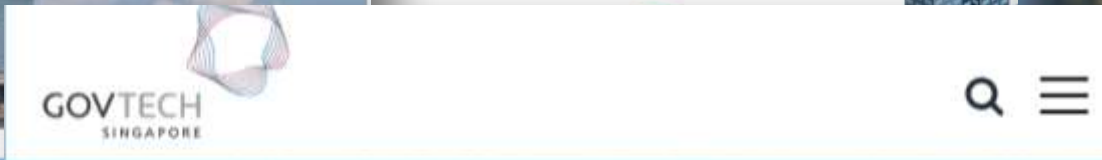




beta About Smart Nation Initiatives Ap



Walt Disney's EPCOT was, for many, the first glimpse of what a city not have been the vision the man originally envisioned, but the then encapsulated the ideas of how the future would look through the ey it's become little more than a curio by modern standards, it set min



14 May 2017  
**Highway to Singapore's Smart Future**



Singapore is striving to be the world's first 'smart city'  
*Sensors, sensors everywhere.*



SHARE Ask Jamie @ GovTech





SAVE THE DATE

THE **YEAR IN INFRASTRUCTURE 2017** CONFERENCE

October 10 – 12, 2017 | Marina Bay Sands | Singapore

**REGISTRATION OPENS FEB. 21, 2017**

[WWW.BENTLEY.COM/YII2017](http://WWW.BENTLEY.COM/YII2017)



# *Going Digital...!*





# *Going Digital:* Reality Modeling Advances *Surveying*, and Engineering...



May 30, 2017

**Bentley**<sup>®</sup>  
Advancing Infrastructure





**BIM** Better *Project Delivery*



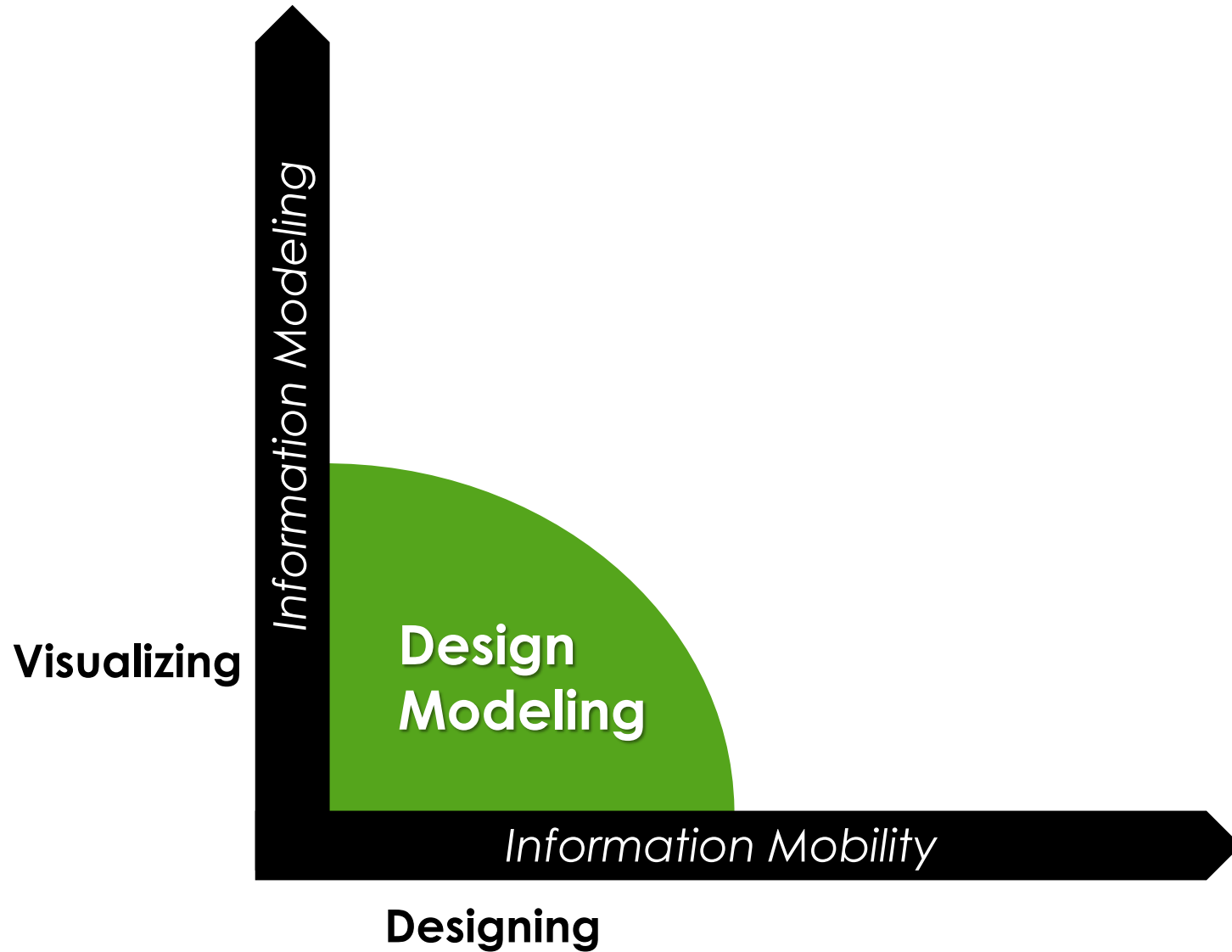


BIM

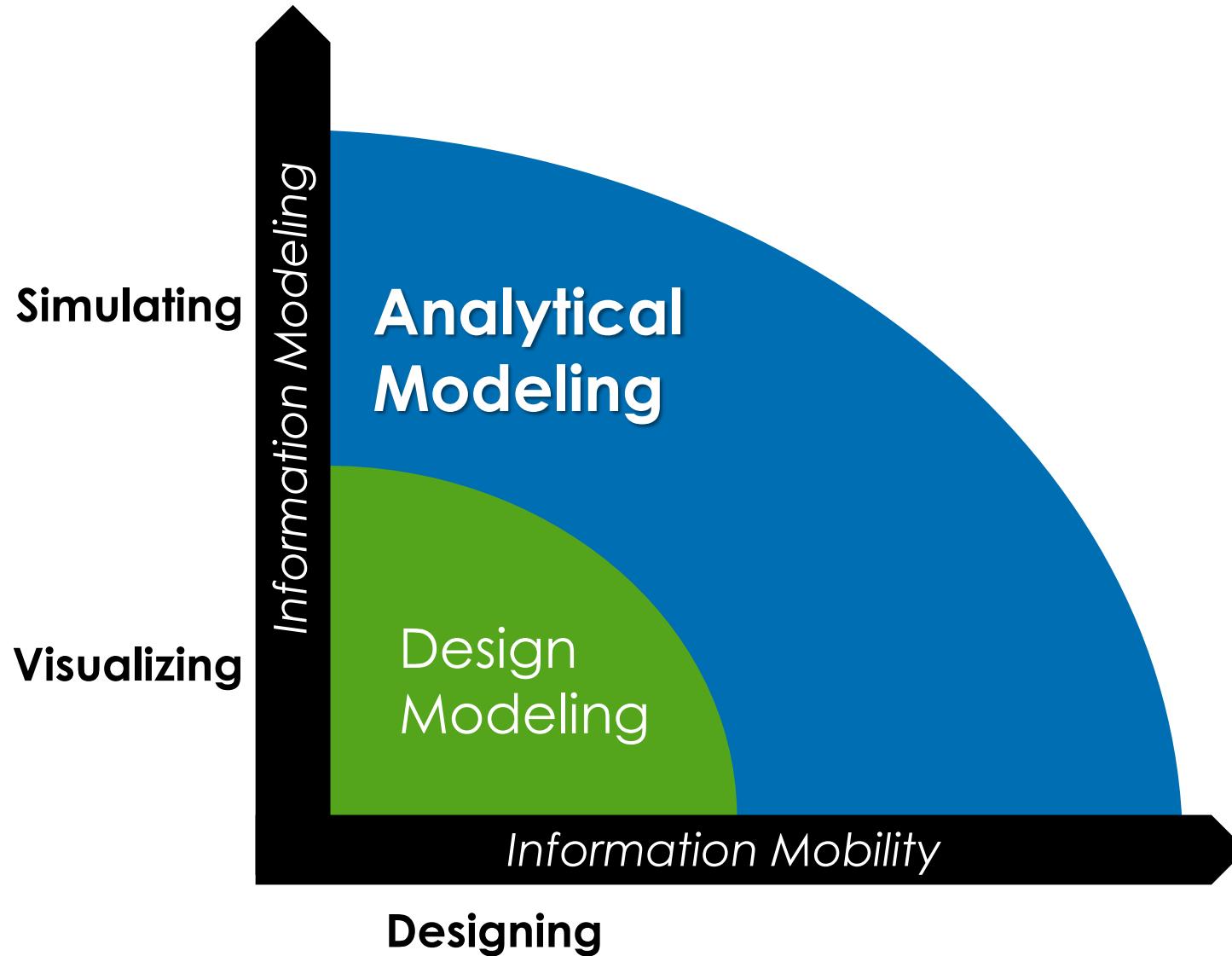
Better *Project Delivery*  
through Breadth of  
Information *M*obility

**CAPEX**

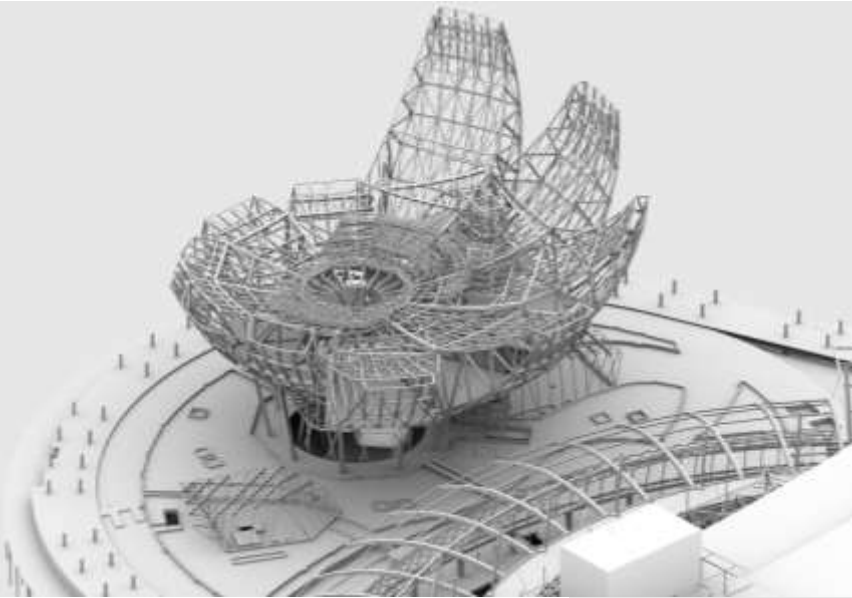




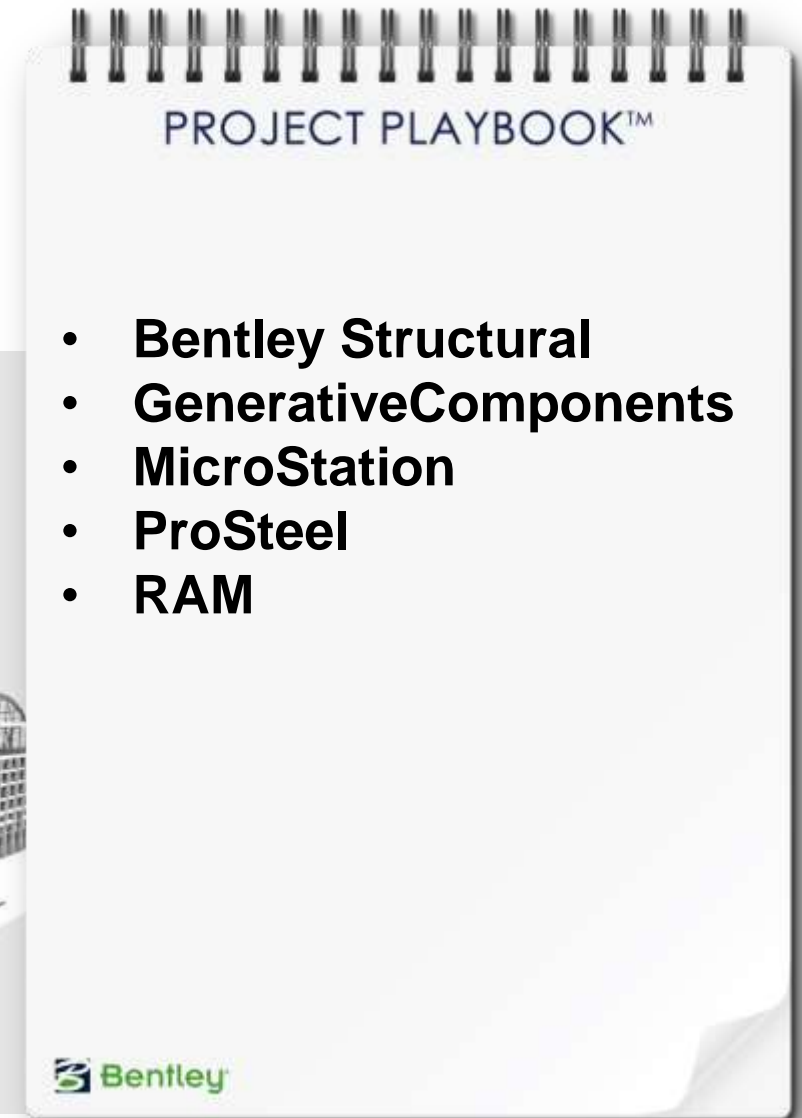




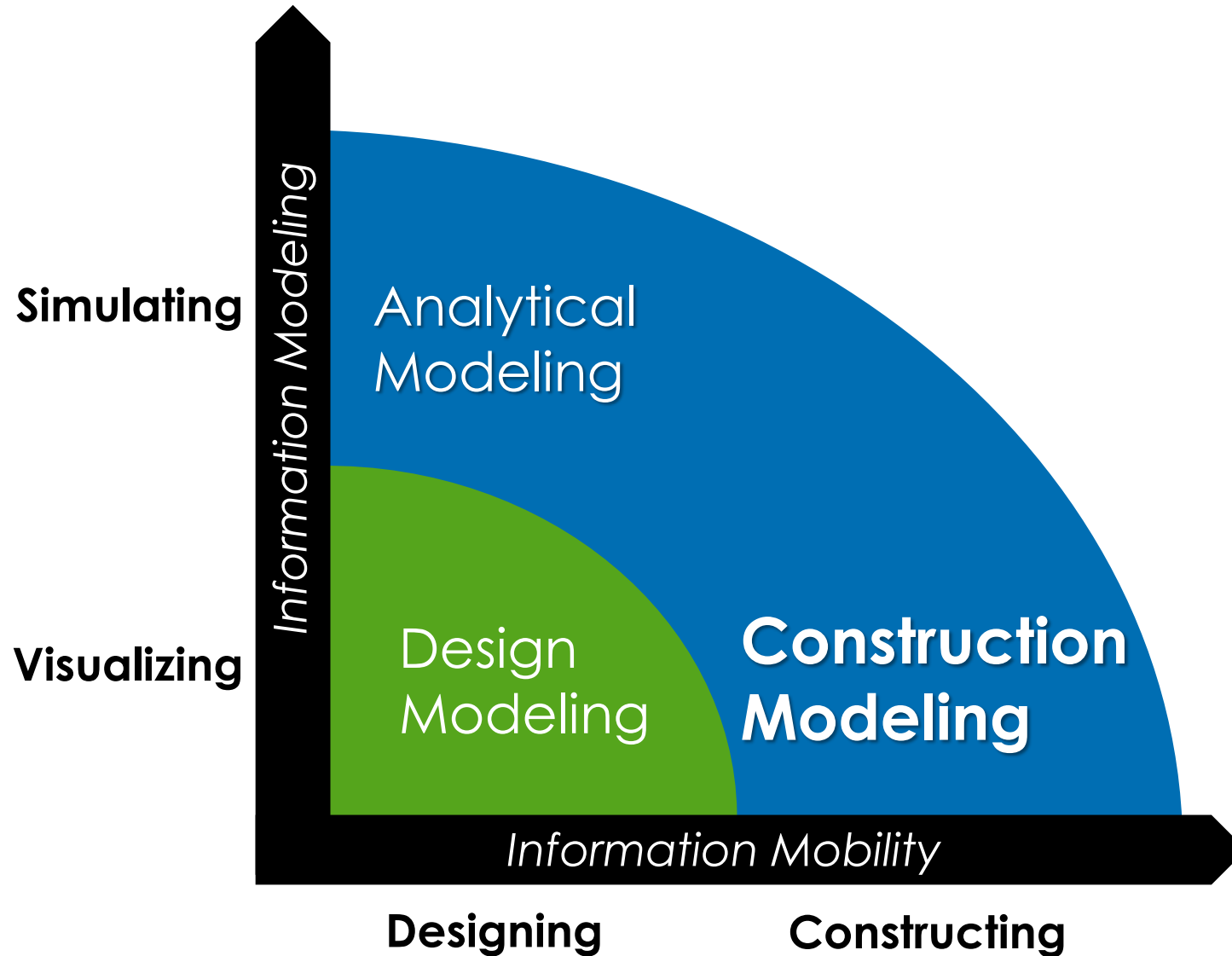
# Arup Singapore | Marina Bay Sands Singapore



2010 *Be Inspired* **Winner**  
Innovation in Structural Engineering







**Immersing**

**Simulating**

**Visualizing**

*Information Modeling*

*Asset Performance Modeling*

Analytical  
Modeling

Design  
Modeling

Construction  
Modeling

*Information Mobility*

**Designing**

**Constructing**

**Operating**



**OPEX**

Better  
**Asset  
Performance**

through  
Depth of  
Information  
Modeling

**BIM**

Better **Project Delivery**  
through Breadth of  
Information Mobility

**CAPEX**

**OPEX**

Better  
**Asset**  
**Performance**

through  
Depth of  
Information  
**M**odeling

**BIM**

Better **Project Delivery**  
through Breadth of  
Information **M**obility

**TOTEX**

Advanced Project

**CAPEX**



**Immersing**

**Simulating**

**Visualizing**

Information Modeling

Analytical Modeling

Design Modeling

Construction Modeling

Asset Performance Modeling

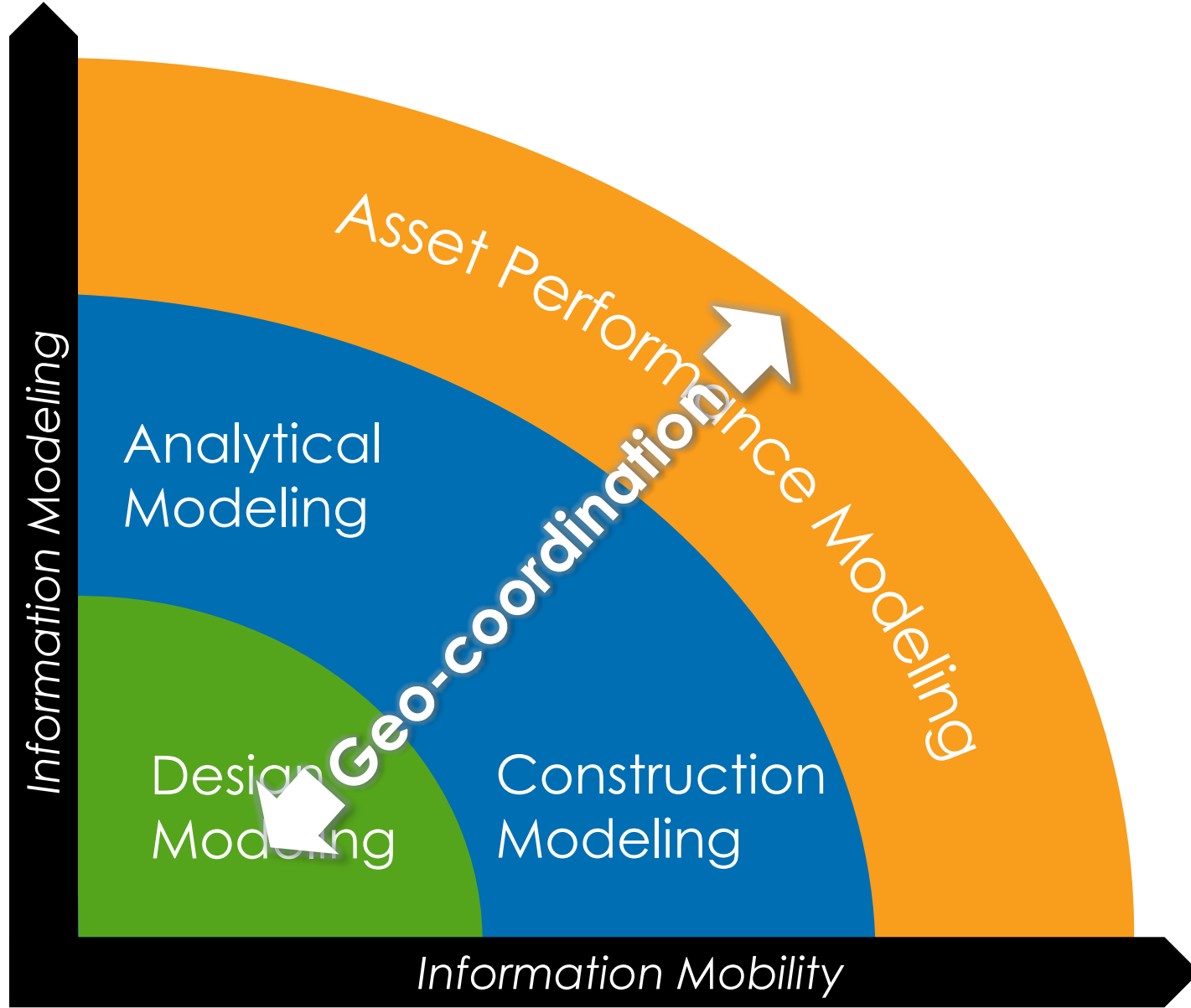
Geo-coordination

Information Mobility

**Designing**

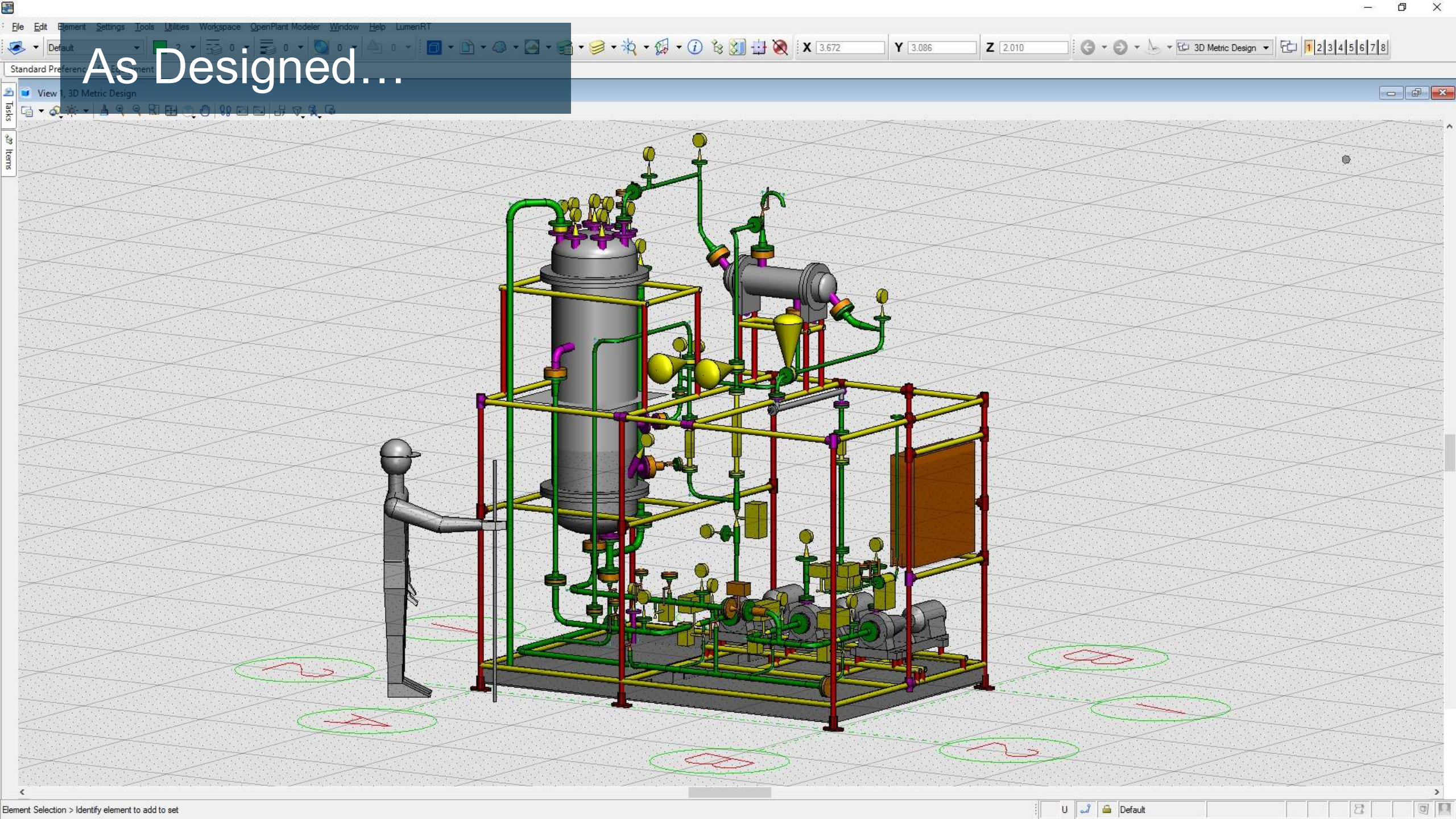
**Constructing**

**Operating**



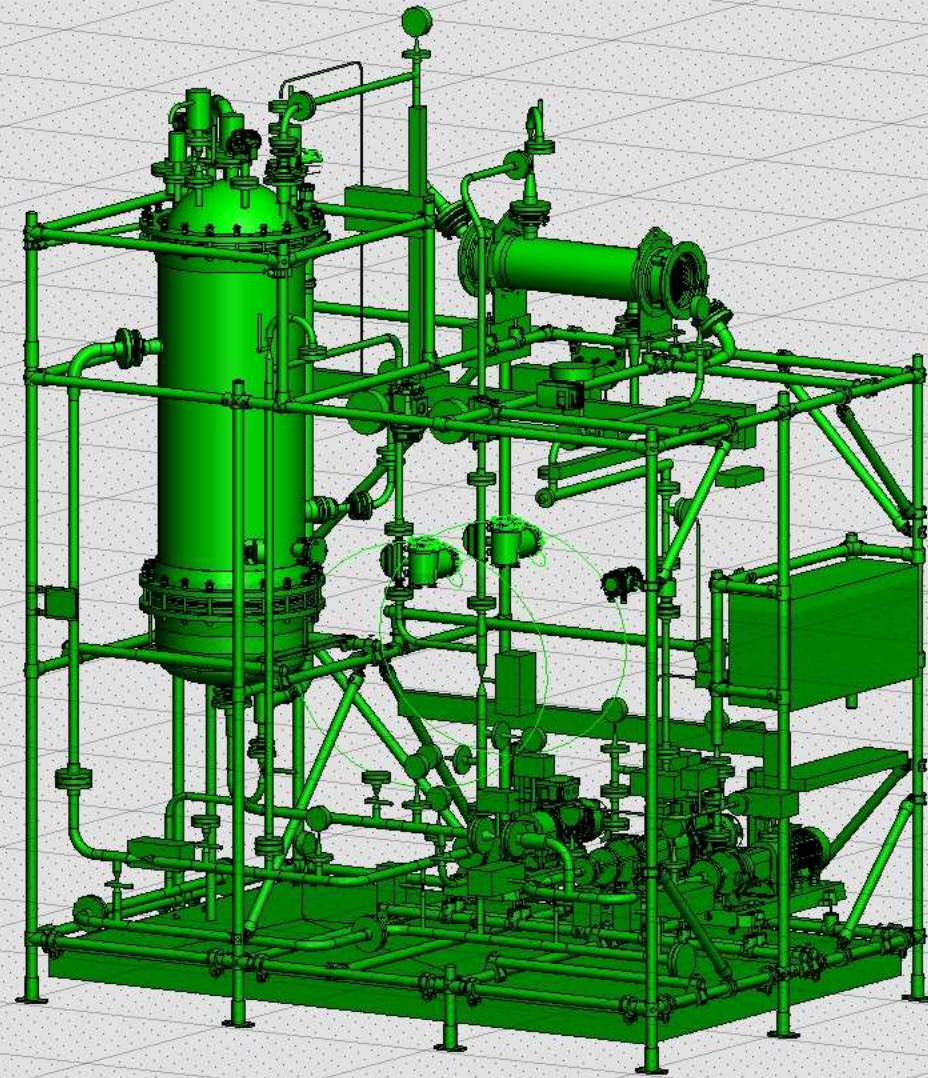


# As Designed...





As Built...





**Immersing**

**Simulating**

**Visualizing**

Information Modeling

Asset Performance Modeling

Analytical Modeling

Design Modeling

Construction Modeling

Information Mobility

**Designing**

**Constructing**

**Operating**

Reality Modeling





Hannover Messe 2017  
Siemens Pre-Press Conference  
Karlsruhe, Germany  
March 14, 2017



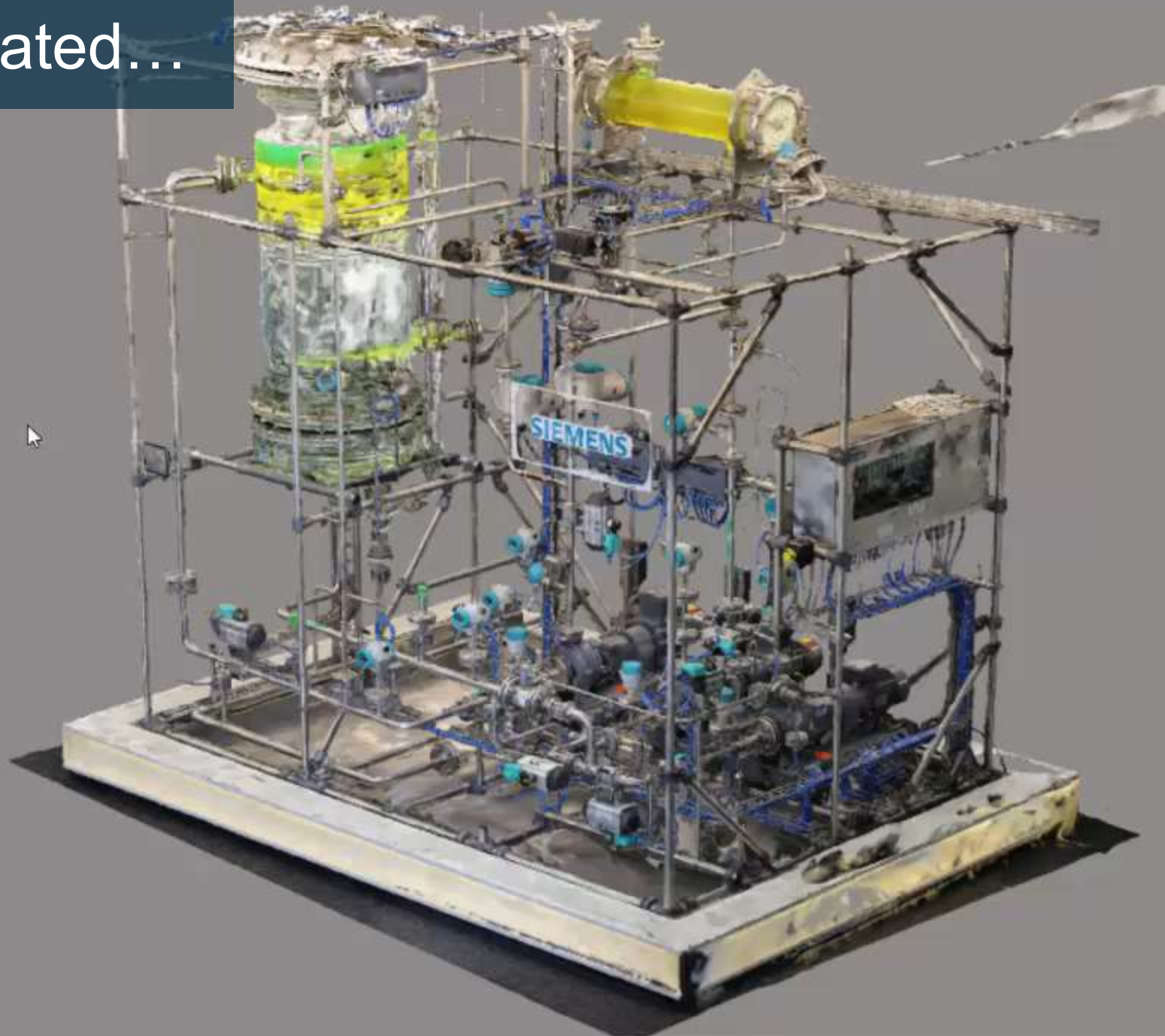
# SIEMENS

*Ingenuity for life*

[siemens.com](https://www.siemens.com)

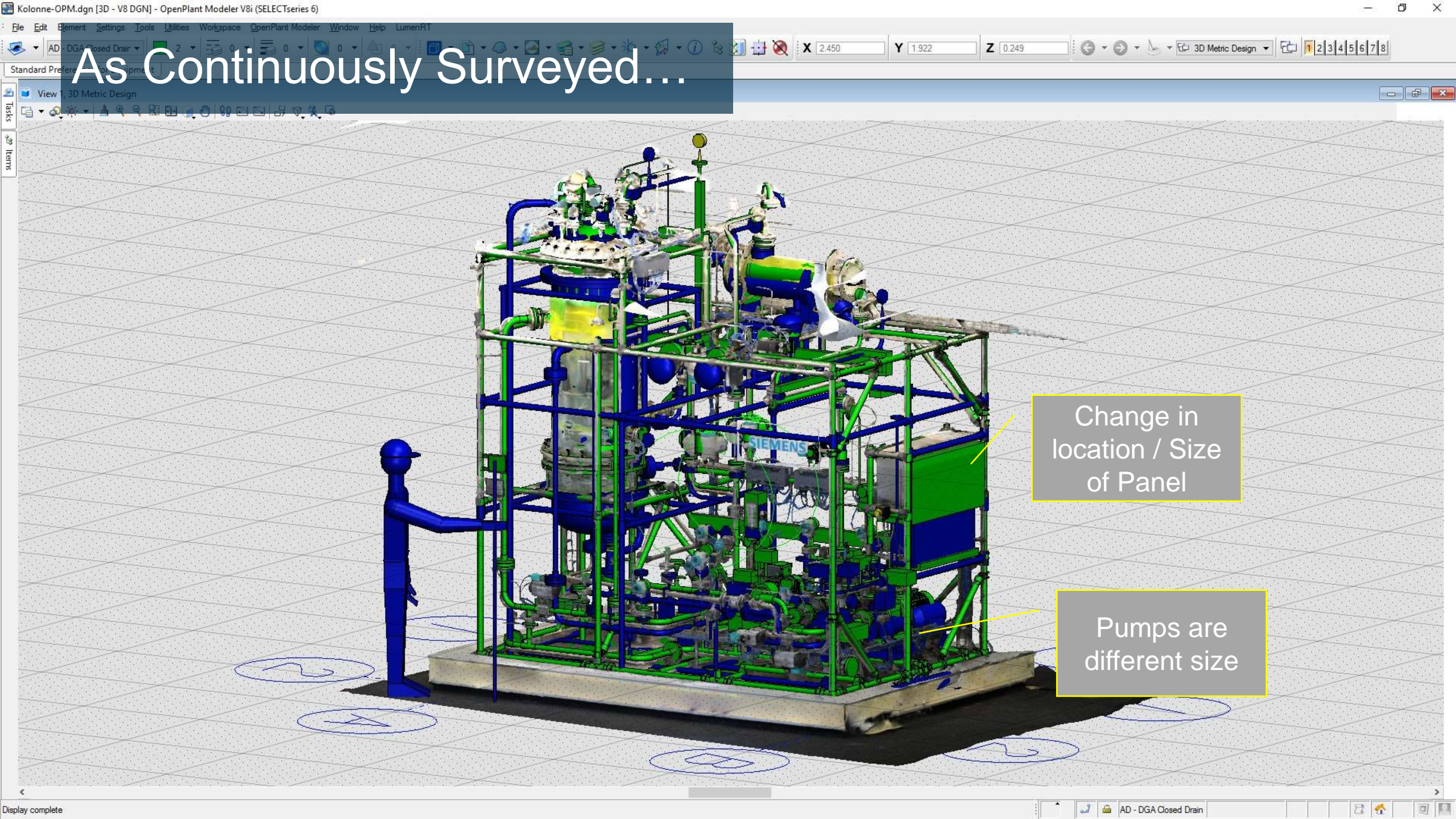


As Operated...





# As Continuously Surveyed...



Change in location / Size of Panel

Pumps are different size



Partnership  
to include application  
development by  
Bentley for  
MindSphere

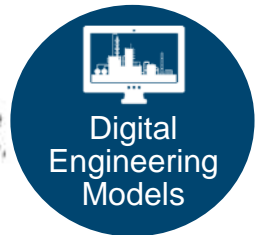
MindSphere – the cloud-based, open IoT operating system

MindApps

Developed by Siemens, OEMs,  
end customers and App developers



Optimized performance of  
assets, energy and resource  
consumption, maintenance,  
services ...



MindSphere

Various cloud infrastructures:  
Public, private or on-premise



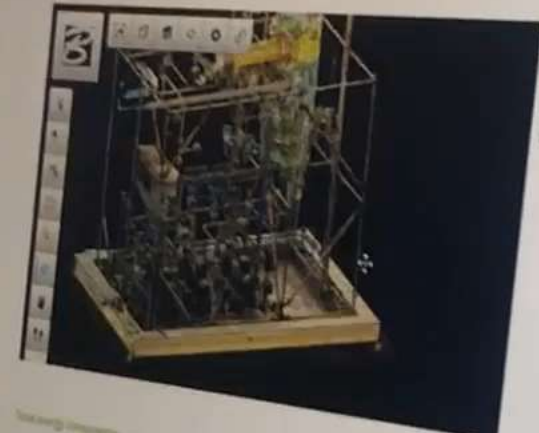
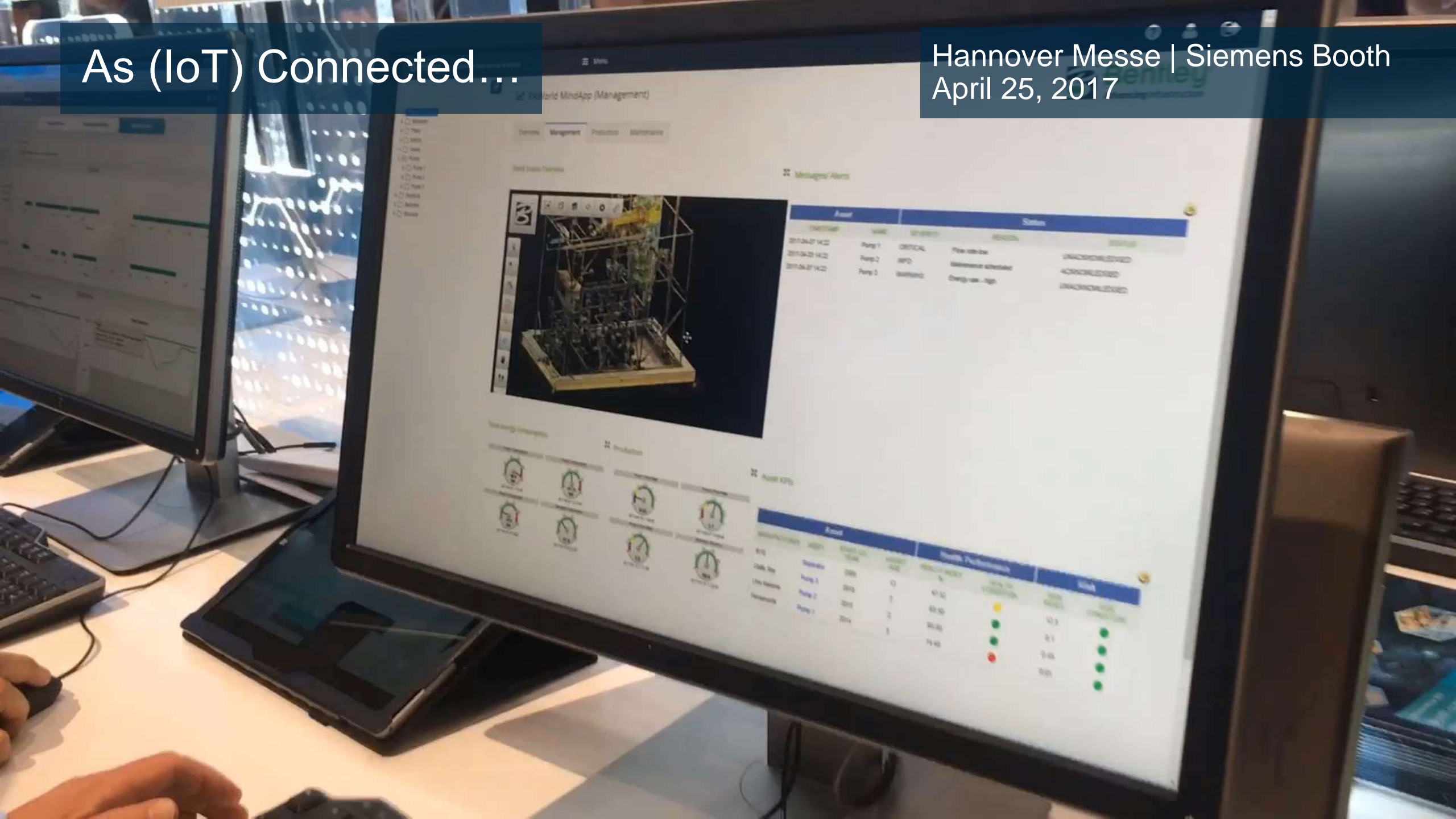
MindConnect

Secure plug and play connection  
of Siemens products

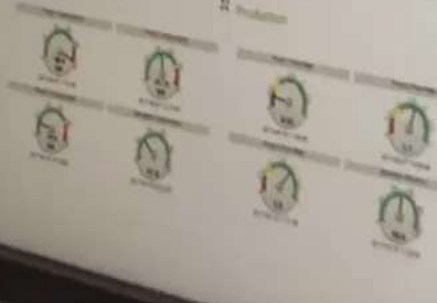


As (IoT) Connected...

Hannover Messe | Siemens Booth  
April 25, 2017



Event	Name	Severity	Message	Status
2017-04-27 14:22	Pump 1	CRITICAL	Flow rate low	UNACKNOWLEDGED
2017-04-27 14:22	Pump 2	INFO	Maintenance scheduled	ACKNOWLEDGED
2017-04-27 14:22	Pump 3	WARNING	Overtemp - high	UNACKNOWLEDGED



Event	Health Performance	Link
2017-04-27 14:22	95%	View Details
2017-04-27 14:22	92%	View Details
2017-04-27 14:22	88%	View Details
2017-04-27 14:22	85%	View Details
2017-04-27 14:22	82%	View Details
2017-04-27 14:22	78%	View Details





## BEST OVERALL

### Context Capture (Bentley Systems)



"Enables maintenance professionals (as well as operations and engineering) to work in a realistic 3D visualization environment. Easy to use modeling software creates 3D models of your assets from photographs you take and or using drones to take high resolution pictures. Establishes an immersive 3D environment for asset health monitoring, reliability and maintenance planning as well as work execution. Then with continuous surveying of your assets in the same way (drone or pics), software compares to baseline for changes.

#### Benefits:

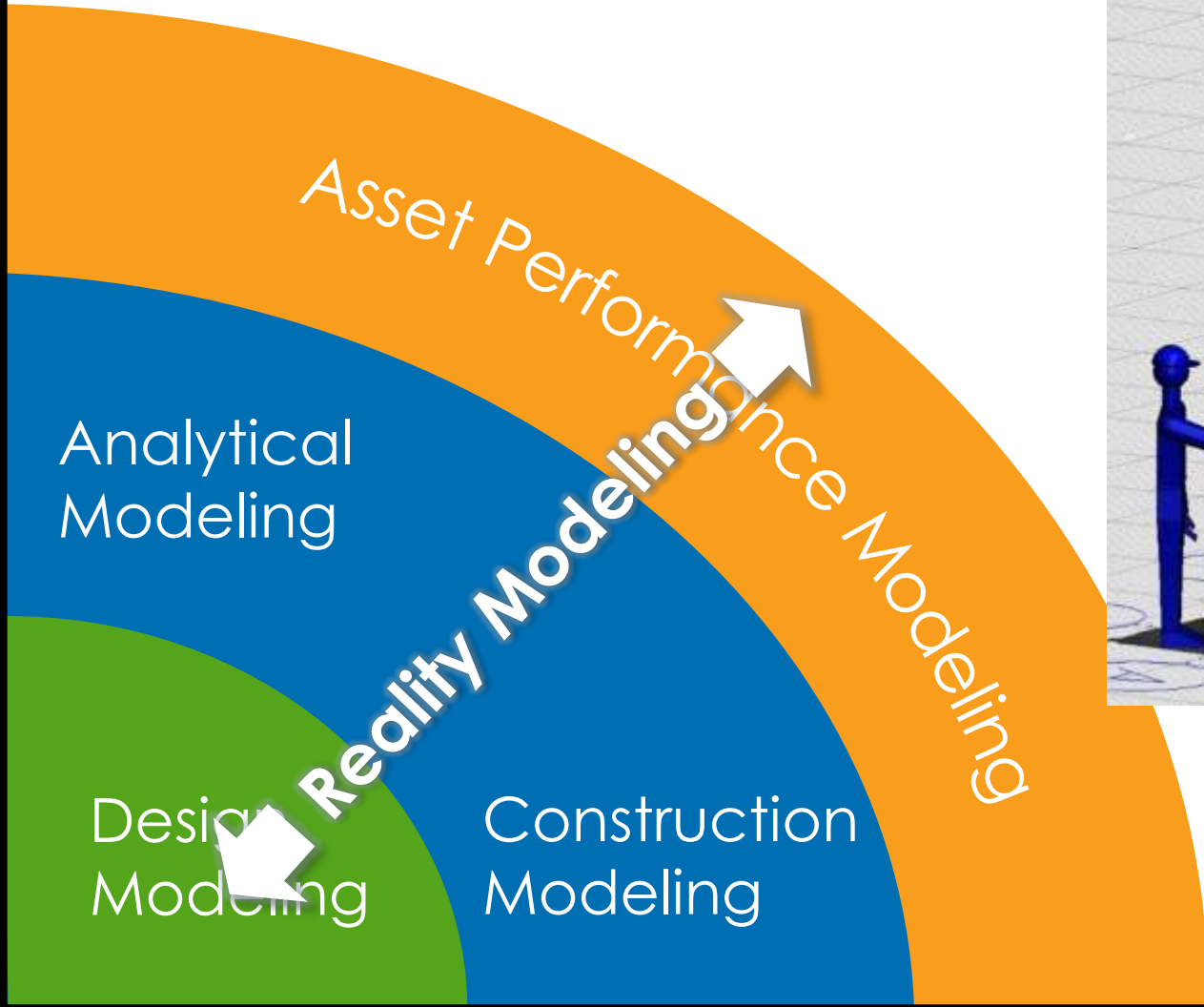
- Quickly and easily create 3D models of your assets from photographs
- Pinpoint locations visually to know specifically where you need to inspect and/or address an issue

Immersing

Simulating

Visualizing

Information Modeling



Analytical Modeling

Design Modeling

Construction Modeling

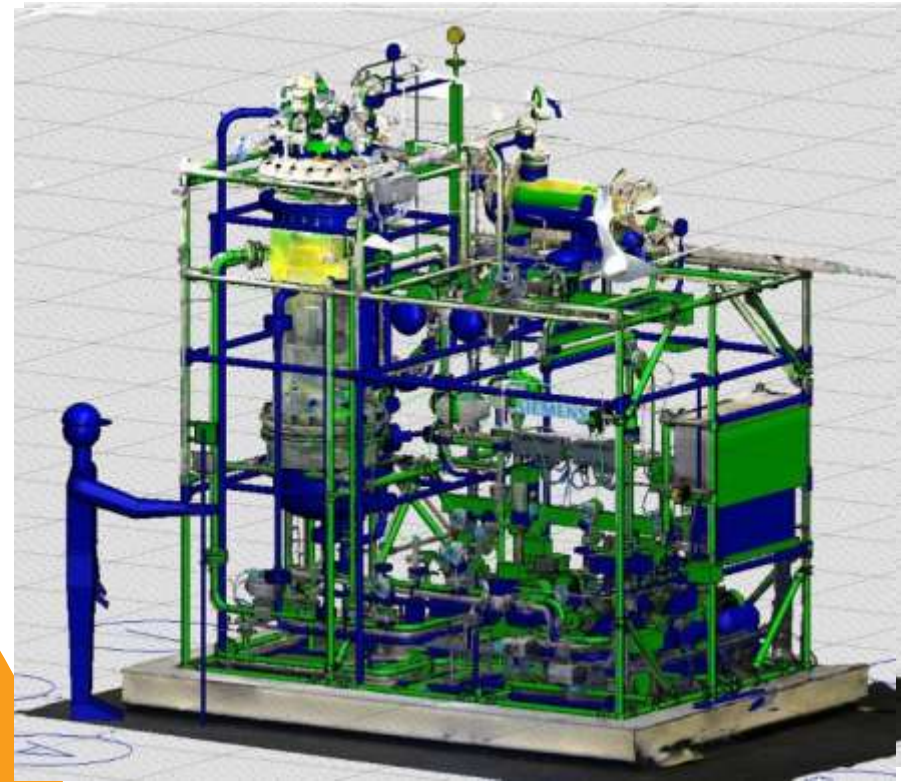
Asset Performance Modeling

Designing

Constructing

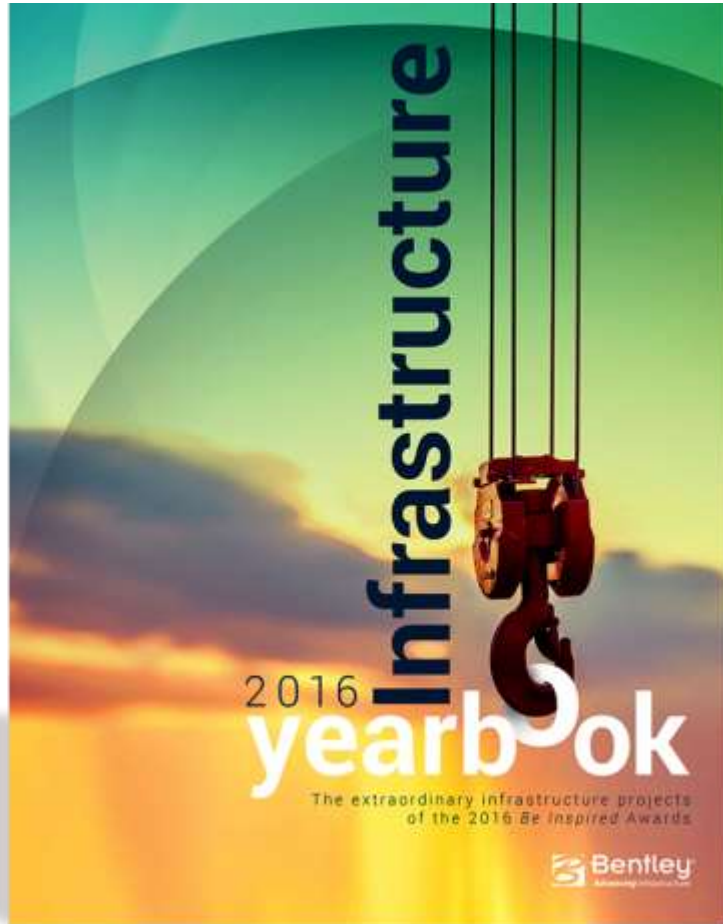
Operating

Information Mobility





*Be Inspired Awards*  
November, 2016



**Reality Modeling  
credited by:**

**15 *Be Inspired* Finalists  
& 62 Nominees**

[www.Bentley.com/yearbook](http://www.Bentley.com/yearbook)



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Follow us on Twitter:  
[@BentleySystems](https://twitter.com/BentleySystems)

## ***Reality Modeling Goes Mainstream!***

*Accelerating ContextCapture Adoption Spurs Conceptioneering, Constructioneering, and Inspectioneering; Hybrid Inputs Now Embrace Scans as well as Photos*

LONDON – The *Year in Infrastructure* 2016 Conference – 2 November 2016 – At this annual conference for infrastructure thought leaders, CEO Greg Bentley made the case in his Keynote that since Bentley Systems’ acquisition and assimilation of *ContextCapture* software in 2015, the proliferation of *reality modeling* across users’ projects—and across Bentley’s software portfolio



# Reality Modeling "Footprint" (2017 to date)



# Corridor (Design)

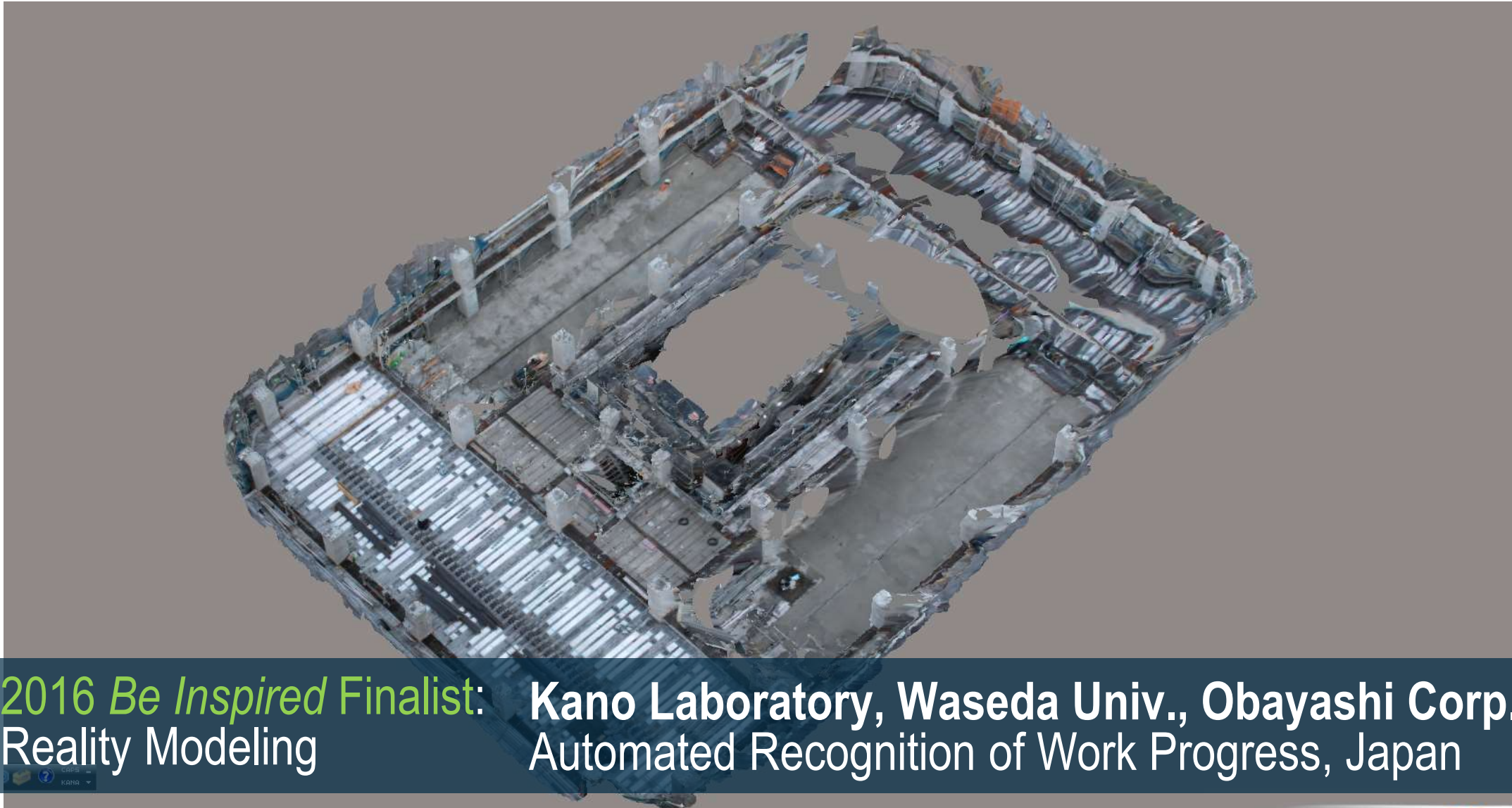


2016 *Be Inspired* Finalist:  
Reality Modeling

CH2M Fairhurst Joint Venture  
A9 Dualling Program, UK



# Campus (Construction)



2016 *Be Inspired* Finalist:  
Reality Modeling

Kano Laboratory, Waseda Univ., Obayashi Corp.  
Automated Recognition of Work Progress, Japan



# City (Operations)



**2016 *Be Inspired* Winner:**  
Reality Modeling

**City of Helsinki**  
Helsinki 3D+, Finland



# HELSINKI 3D+

A New Generation of City Models

Helsinki





3D data of Helsinki since **1985** ...



# 1999 3D-simulator

LOD 2 + new developments



3D-model + game engine [RealiMation]



Real-time simulator in exhibitions

City of Helsinki / 3D City Information Model



# Master Plan 2002





# 2003 Pasila

3D model  
Design alternatives  
Real-time-simulator



Jarmo Suomisto / City of Helsinki / 3D City Information Model



# New Challenges

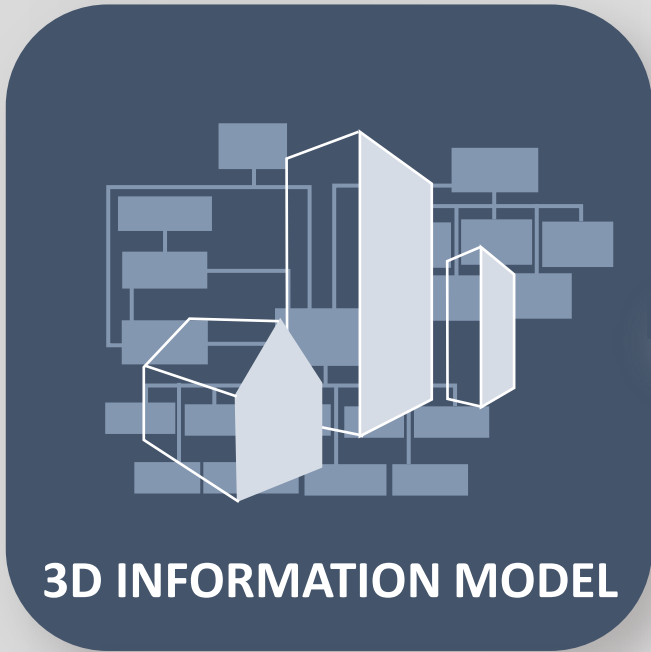
- Visual WOW! is **not enough**
- Helsinki **SMART City** goals
- Broad **technological** development
- **CityGML-standard** and progress in European cities
- Need to have more **accurate data and analyzes**
- Need to **modernize** working methods
- **Open data** culture
- **Leap in the dark** with new technology
- First City within **Nordic** countries



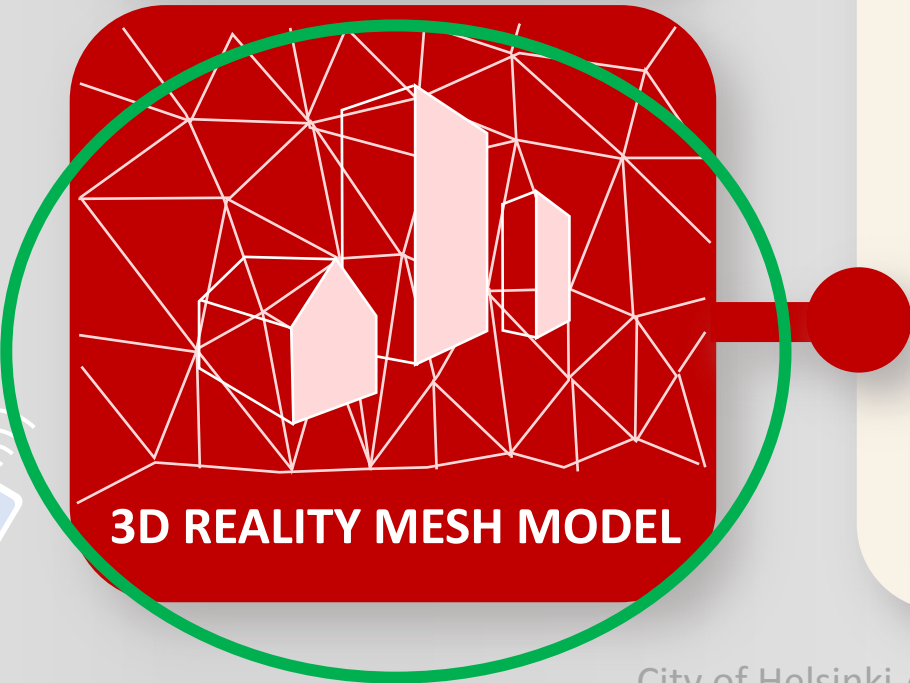




023	abc
056	def
089	ghi
.....	.....



**3D INFORMATION MODEL**



**3D REALITY MESH MODEL**

## HELSINKI 3D+ UTILIZATION PILOTS PORTFOLIO

### 3D INFRASTRUCTURE

- 1 **Open Data** On-line Service / December 1. 2016
- 2 Model **maintenance** processes
- 3 Intranet Oblique Foto & LAS **service**

### PROCESS DEVELOPMENT

- 4 CityGML/InfraModel/IFC **Collaboration**
- 5 3D Virtual **Parks** / Tree derivation from LAS data
- 6 **Underwater** Citymodel / Kruunusillat Bridge

### SMART SOLUTIONS

- 7 **Citizen Interaction** Platform / Serious Gaming
- 8 **Underground** Service Tunnel Marketing / Serious Gaming
- 9 Urban development **energy use** simulation

### URBAN ANALYTICS

- 10 Quality indicators of **Urban space** / Aalto University
- 11 CO2 / GHG / **Emission analyses** / Low Carbon City Lab
- 12 **Solar Potential** Analyses / TUM































Helsinki




<http://3d.hel.ninja/mesh/>







Finland Weather

Helsinki, Finland Local Weather  17°C

Personalized Forecasts: [Allergies](#) ▼

Now

Weekend

Extended 1 - 5 of 90 days

Month

 Yellow Warning for Forest Fire suomi: Metsäpalovaroitus on ...

TODAY  
MAY 29



18°/4°C

Periods of clouds and sun

TUE  
MAY 30



12°/8°

Cooler with a shower or two

WED  
MAY 31



13°/4°

A brief shower or two

THU  
JUN 1



12°/4°

A brief shower or two





Modeling | Helsinki Demo.i.dgn [3D - V8 DGN, Read-Only] - MicroStation

File Home View Curves Solids Surfaces Mesh Content Analyze Constraints Utilities Drawing Aids

Attributes: None | WMS

Primary: Explorer, Attach Tools, Models, Level Display

Selection: Element Selection, Fence Tools

Placement: Slab, Sphere, Cylinder, Solid By Profile

Manipulate: Move, Copy, Rotate

Modify: Modify Solid, Features, Boolean Tools

Groups: Create Region

Search Ribbon (F4)

Element Selection

View 2, Default

Group  
Consolidate selected elements into a group (orphan cell)

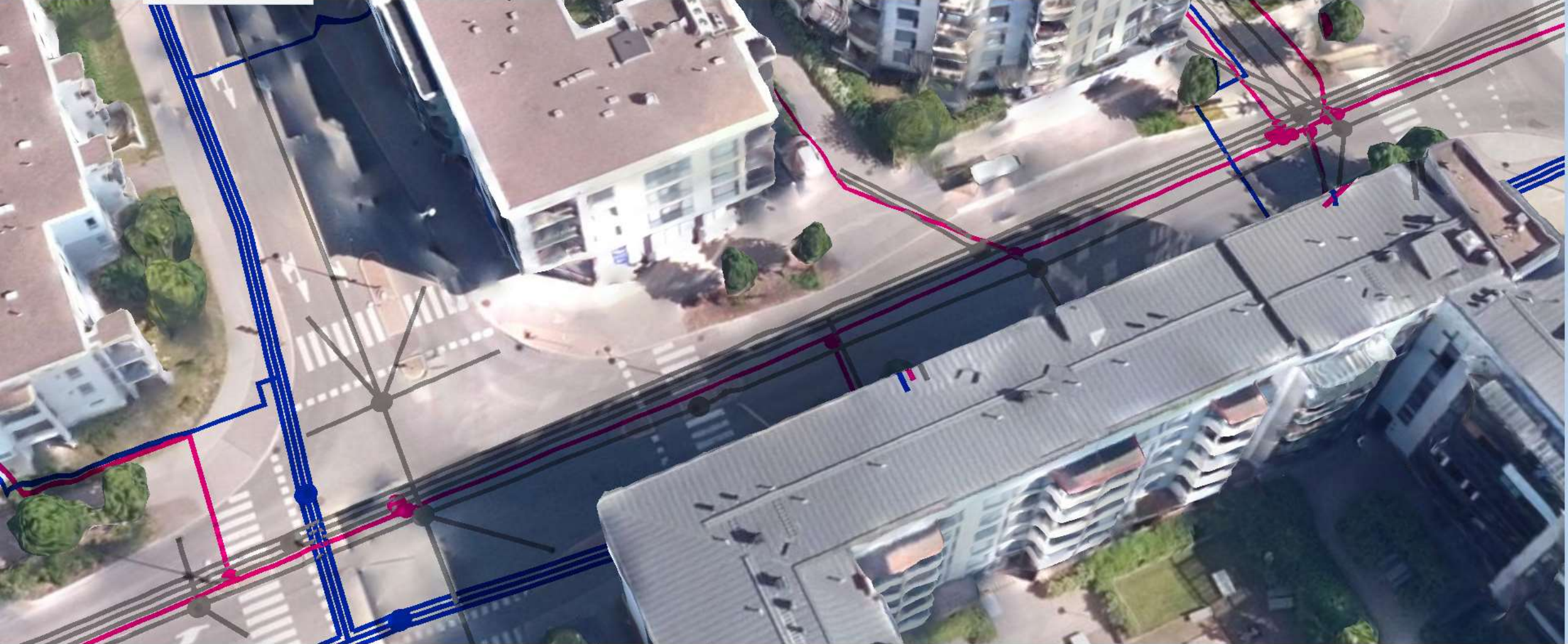


Default Views | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | X | 415006.4060 | Y | 6696049.7558 | Z | -33680.6616

Element Selection > Identify element to add to set | Tool not allowed. File is Read-Only | WMS

Windows taskbar showing various application icons and system tray with date/time: ENG 9:23 AM







Properties

Elements (1)

- BuildingFootprints
  - Items

Explorer

File

Items

Search

- BuildingFootprints
  - Searches
    - BuildingFootprints Search Results (2)

Resources

Sheet Index

Level Display - View...

View Display

(none) Levels

- Helsinki.dgn
  - BuildingFootprints.shp

General

Element Descrip Shape

Level BuildingFootprints

Color ByLevel (0)

Line Style ByLevel (0)

Weight ByLevel (0)

Class Primary

Fill No Fill

Template (None)

Transparency 0

Geometry

Material

Extended

Pattern Parameters

Raw Data

Element ID 1964

Range Low -117.5805m, -181.130

Range High -43.3356m, -118.3894

Size 188

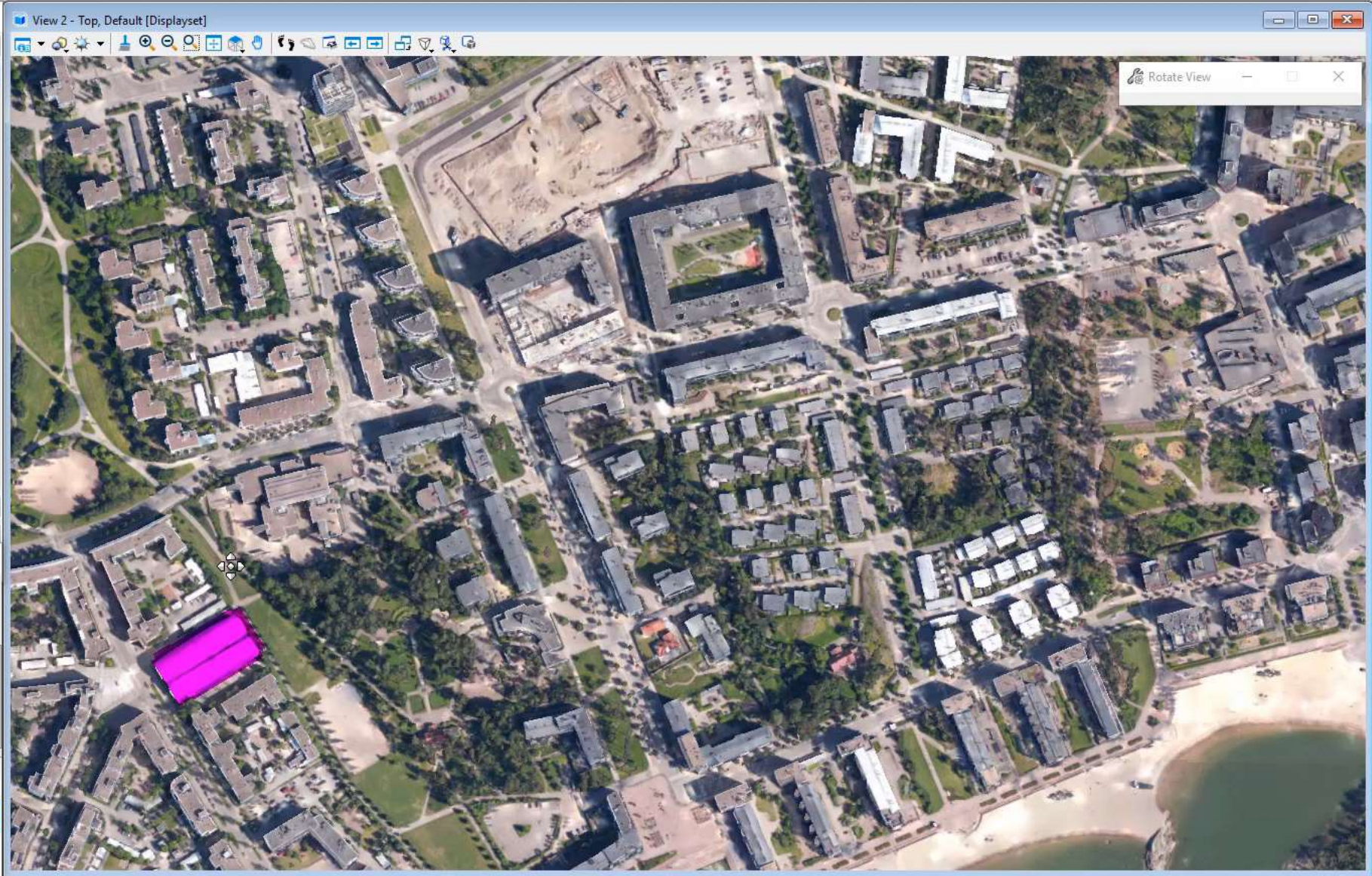
Linkages 0

XAttributes 2

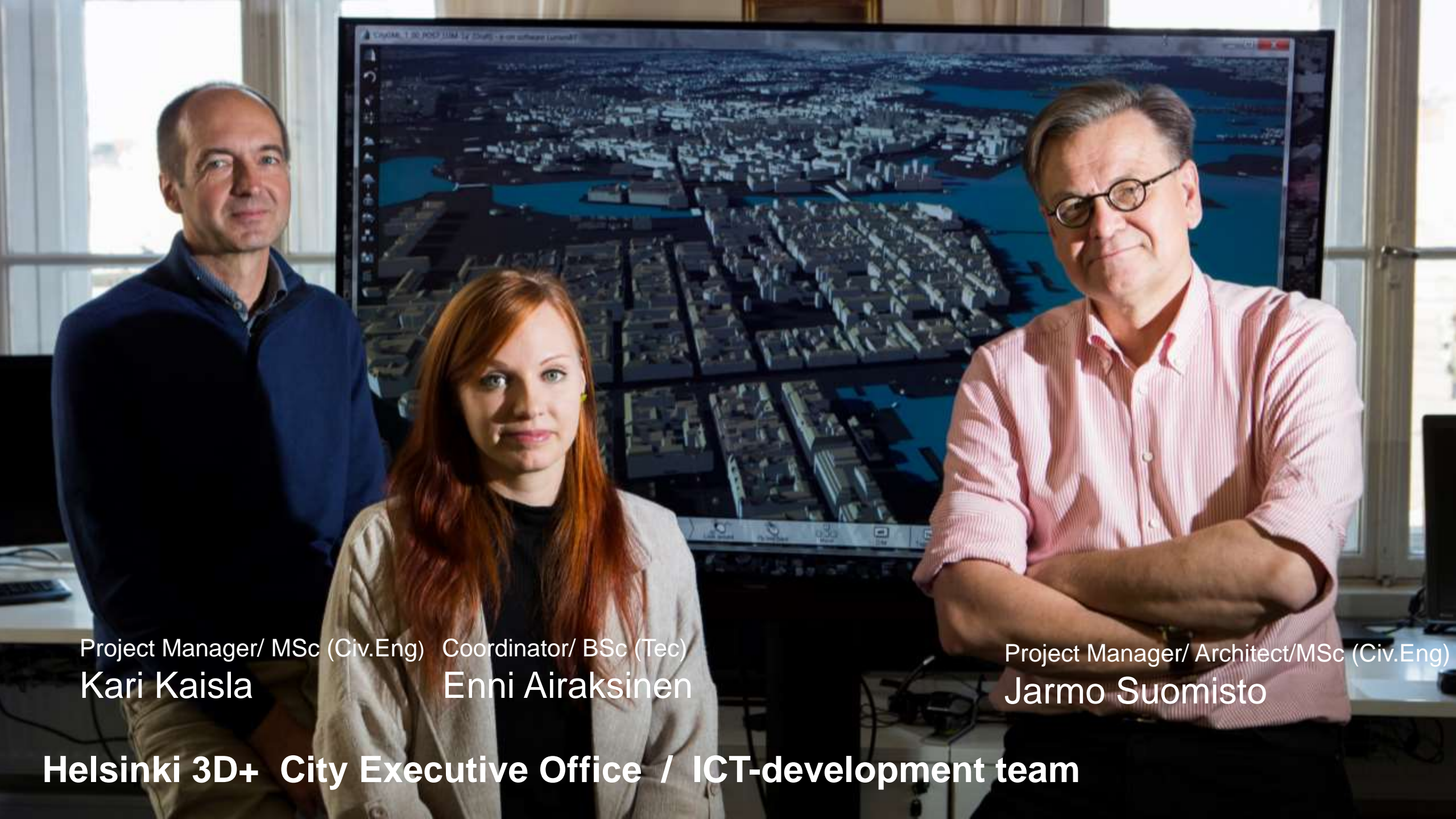
BuildingFootprints

FID 389

Geometry\_A 2338.7154







Project Manager/ MSc (Civ.Eng)  
Kari Kaisla

Coordinator/ BSc (Tec)  
Enni Airaksinen

Project Manager/ Architect/MSc (Civ.Eng)  
Jarmo Suomisto

**Helsinki 3D+ City Executive Office / ICT-development team**





*News Release*  
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[gail.mcgreg@bentley.com](mailto:gail.mcgreg@bentley.com)  
Follow us on Twitter:  
[@BentleySystems](https://twitter.com/BentleySystems)

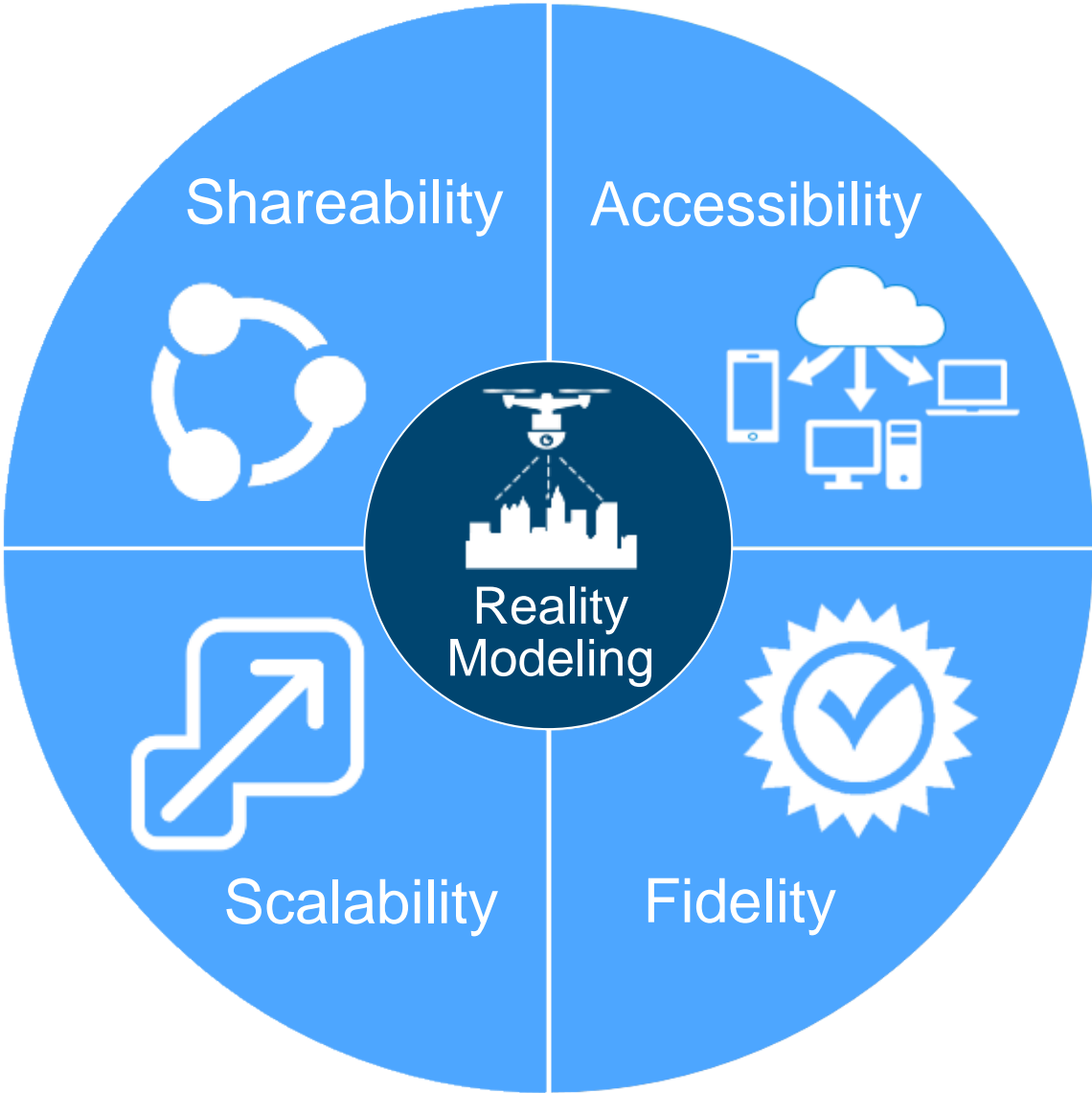
## ***Going Digital: Bentley Systems Advances Reality Modeling to Extend the Scope of Engineering and Surveying Value***

*Combination of New ContextCapture Services and ProjectWise ContextShare Comprehensively Deliver Fidelity, Accessibility, Scalability, and Shareability*

Houston, TX – SPAR 3D Expo & Conference – April 3, 2017 – Bentley Systems, Incorporated, a leading global provider of comprehensive software solutions for advancing infrastructure, demonstrated at SPAR 3D Expo & Conference (SPAR) new *ContextCapture* offerings for reality modeling that increase joint opportunities in surveying and engineering. *ContextCapture* capabilities now include cloud processing services, a mobile app, and photo planning for Bentley's applications. *ContextShare* extends Bentley's *ProjectWise* connected data environment to securely manage, share, and stream reality meshes, and their input sources, across project teams and applications. *Navigator Web* is a new web application that delivers high-performance streaming of very large reality meshes through the browser to desktop or mobile devices.



# Reality Modeling Advancements (2017)



*ContextCapture*  
cloud processing





File name:

File location:

...



Total photos: 0 | Estimated time: N/A

## No photos added

Click on Add photos to add some



Add photos from  
existing project

Camera position

Associate CONNECT Project

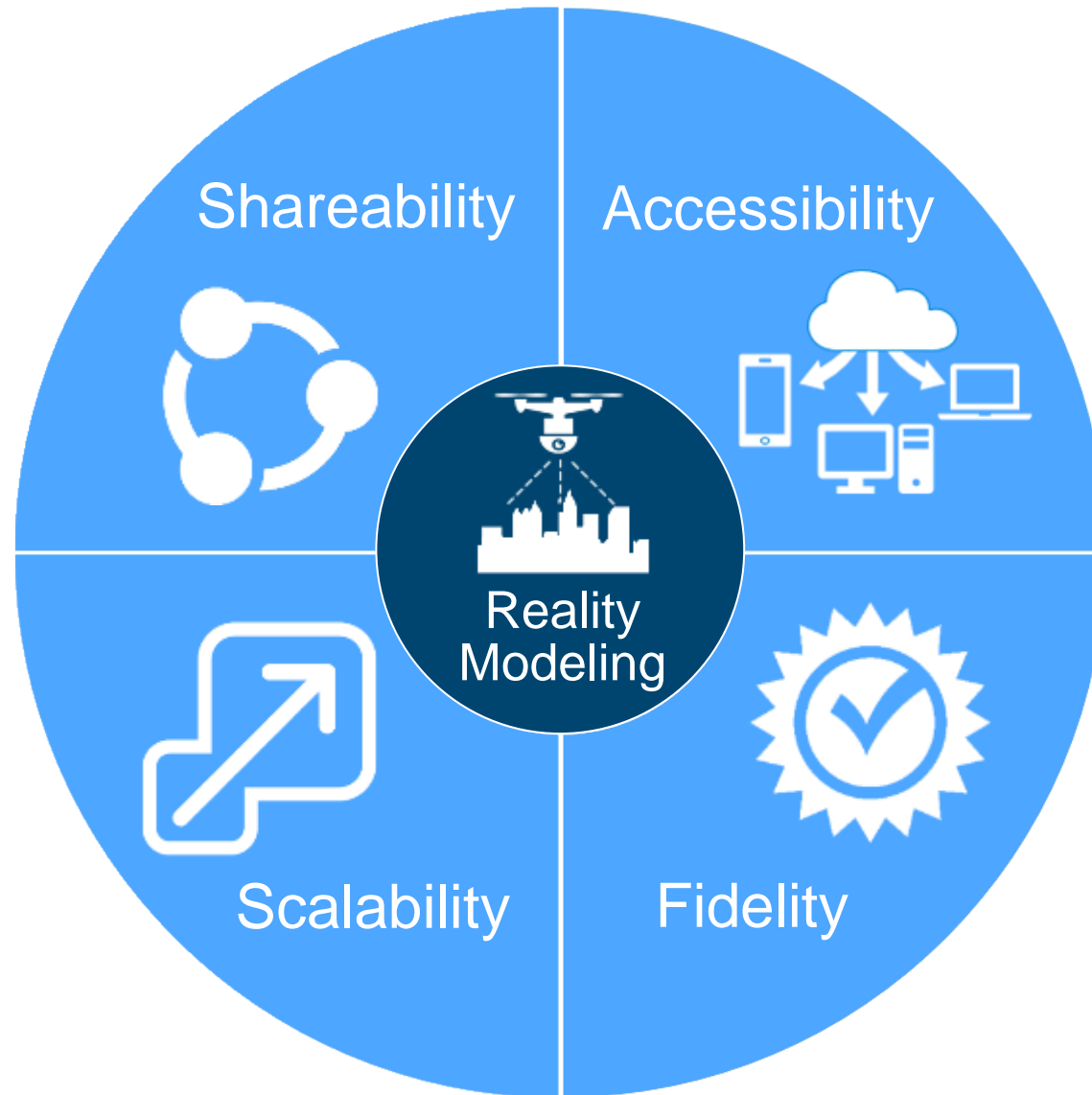
Create

Cancel



# Reality Modeling Advancements (2017)

*ProjectWise  
ContextShare*



*ContextCapture  
Mobile*

*Navigator Web*

*ContextCapture  
cloud processing*

*ContextCapture:*

- photo planning
- hybrid processing



# The Costain Group | Thameslink London Bridge Station



PROJECT

Redevelopment of London Bridge Station ensuring the station remains fully operational



SOFTWARE

ContextCapture

Scalable, Geo-referenced 3D Reality Model

OUTCOME

Minimised on-site work, maximised capture  
Time saved and Safety improved



# London Bridge Station

Better  
Surface  
Definition

Photo Only





# The Capture



GeoSLAM's engineer using a ZEB-REVO scanner



# London Bridge Station

Better  
Surface  
Definition

Photo Only





# London Bridge Station

Better  
Surface  
Definition

Photo and  
Laser  
Scanner





# London Bridge Station

Better  
Surface  
Definition

Photo and  
Laser  
Scanner





# GeoSLAM Warehouse

Improves  
Non-textured  
Surface  
Reconstruction  
Quality

Photo Only





# GeoSLAM Warehouse

Improves  
Non-textured  
Surface  
Reconstruction  
Quality

Photo and  
Laser Scanner





# GeoSLAM Warehouse

Improves  
Non-textured  
Surface  
Reconstruction  
Quality

Photo and  
Laser Scanner





# Thermography (from UAV)...





# Reality Modeling (2017)...





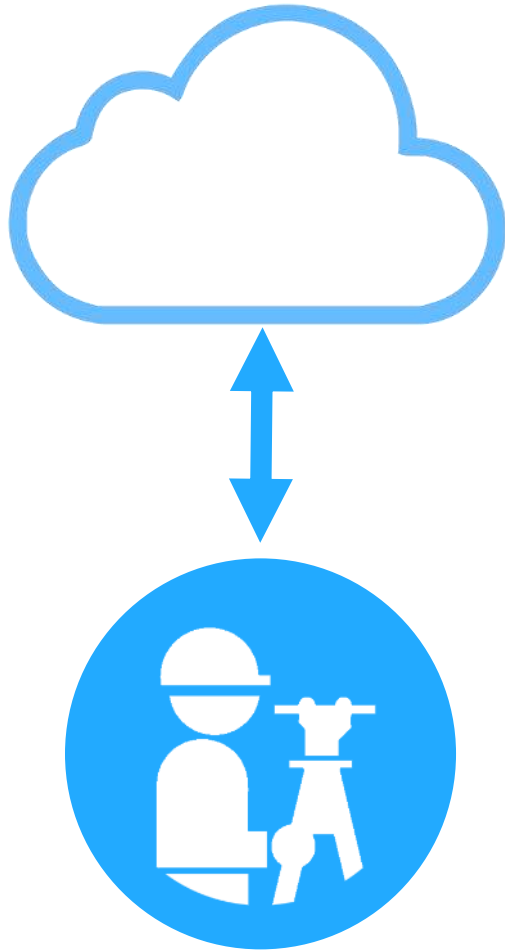
# Going Digital: Reality Modeling Advances *Surveying*, and Engineering...

PROJECT DELIVERY

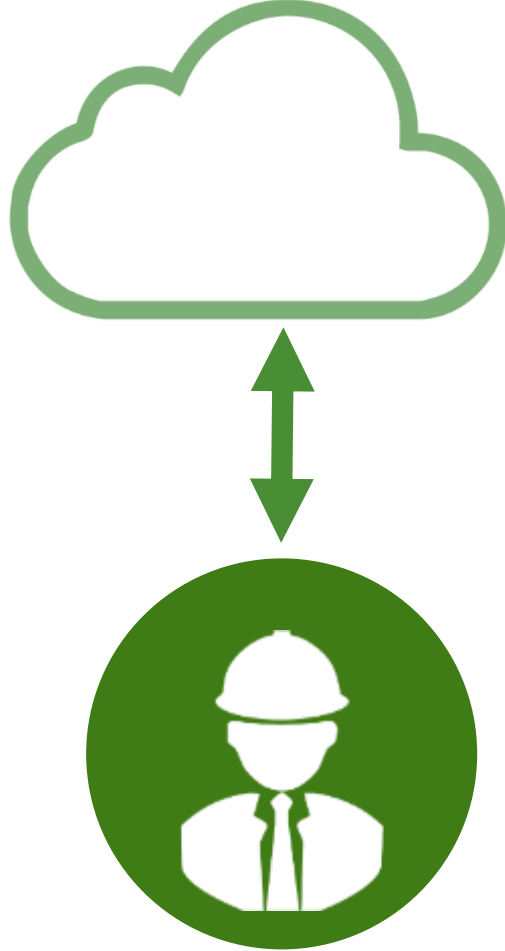




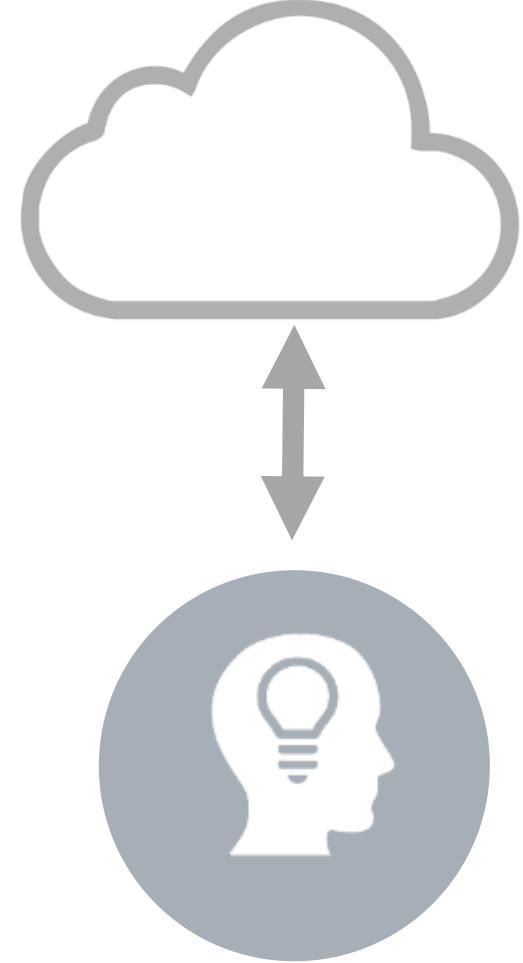
# Surveying



# Engineering

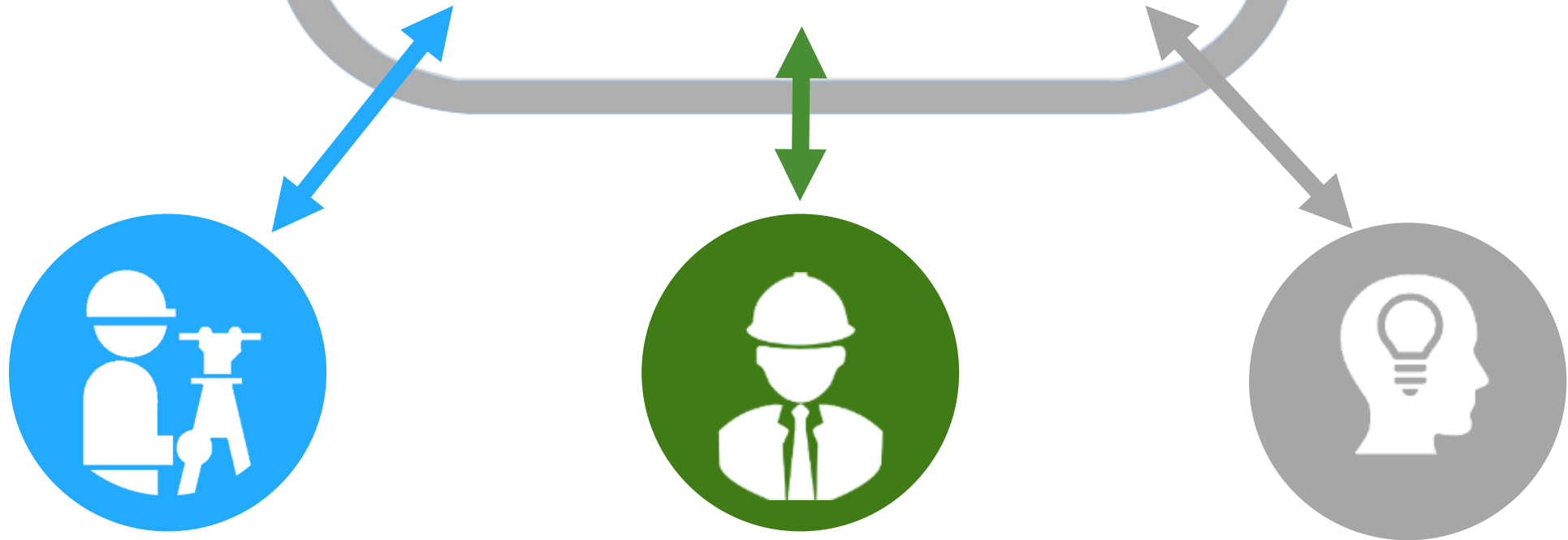


# Conception





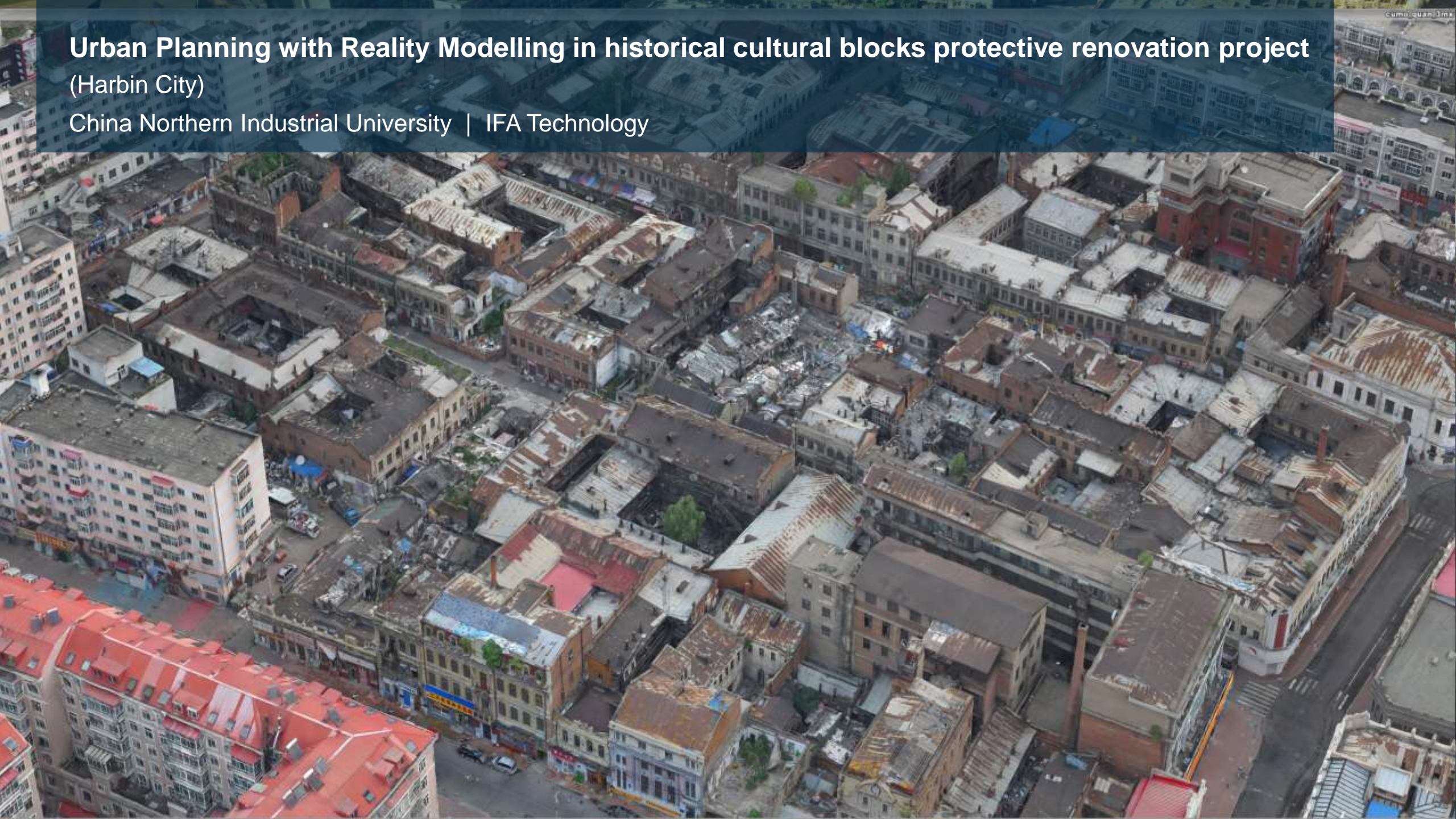
# Conceptioneering!





# Urban Planning with Reality Modelling in historical cultural blocks protective renovation project (Harbin City)

China Northern Industrial University | IFA Technology





# Urban Planning with Reality Modelling in historical cultural blocks protective renovation project (Harbin City)

China Northern Industrial University | IFA Technology





# Urban Planning with Reality Modelling in historical cultural blocks protective renovation project (Harbin City)

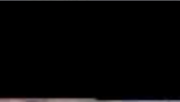
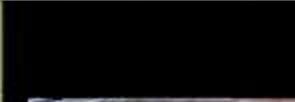
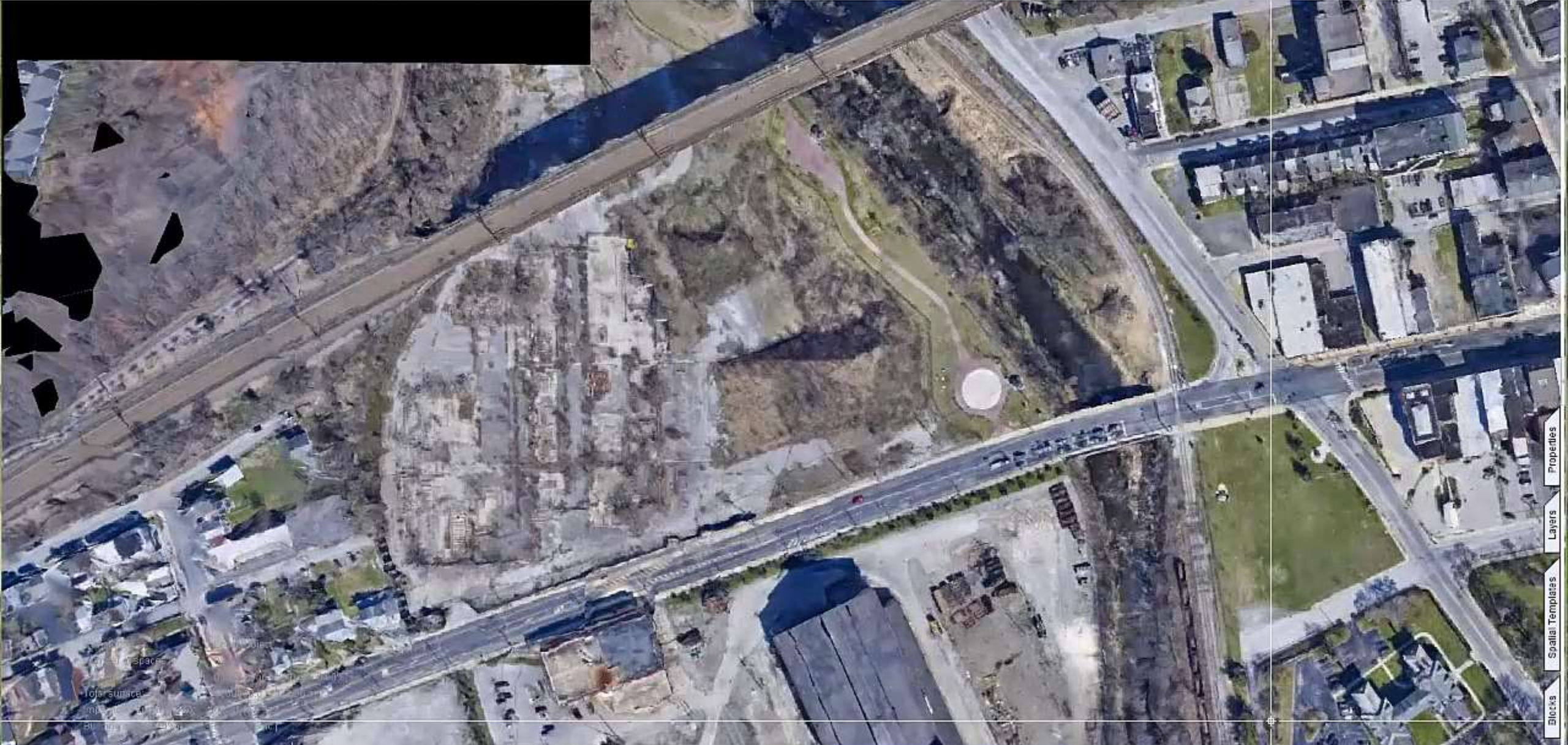
China Northern Industrial University | IFA Technology











Space  
Topo Summary  
Topo Summary  
Topo Summary





Top



Start Station: 0+030

### Bridge Placement

Bridge + Barrier (2 lanes)	Cast-In-Place Box Girder
Bridge Template	Superstructure Type
<a href="#">Show Advanced</a>	



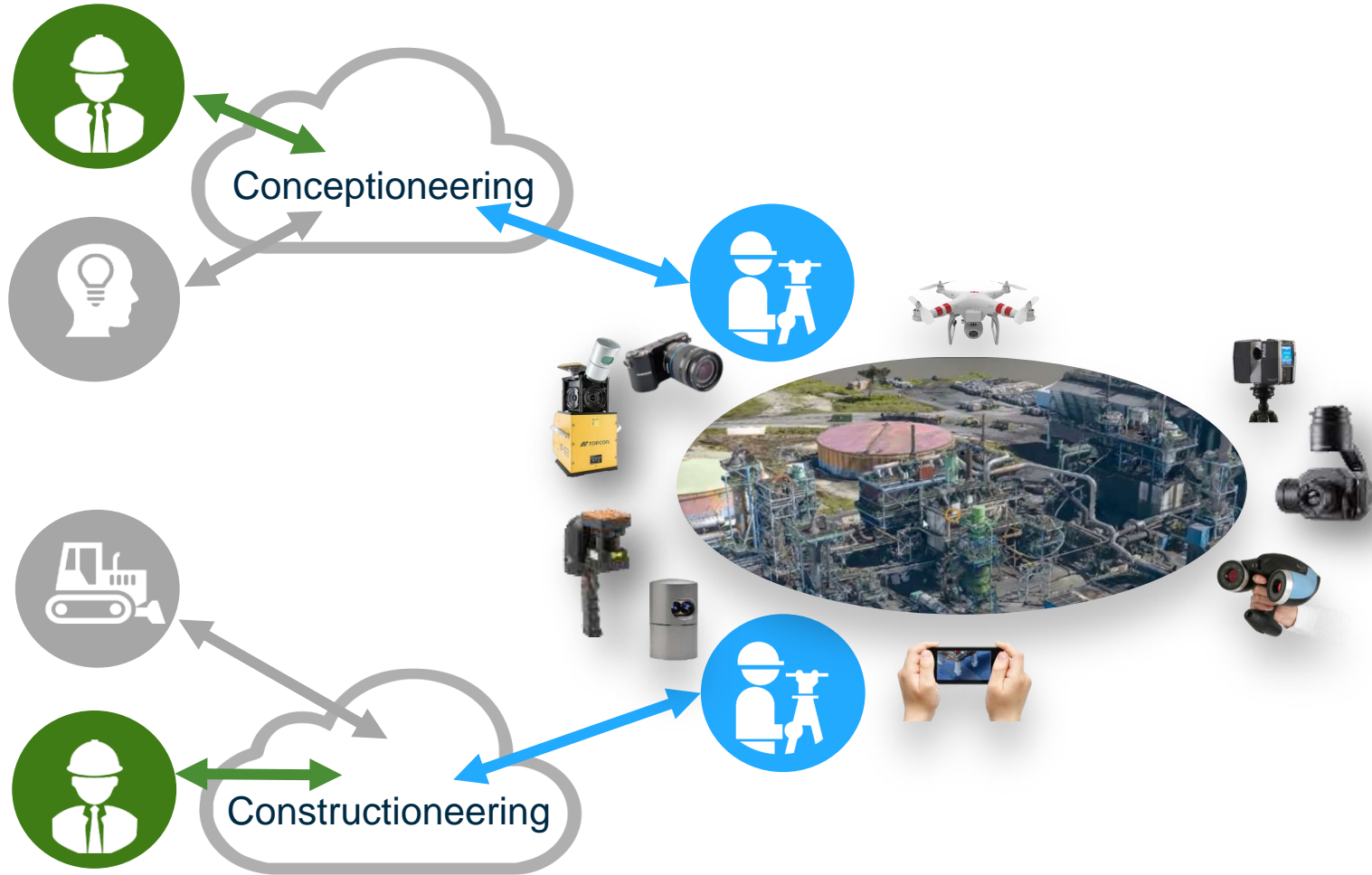
No new notifications





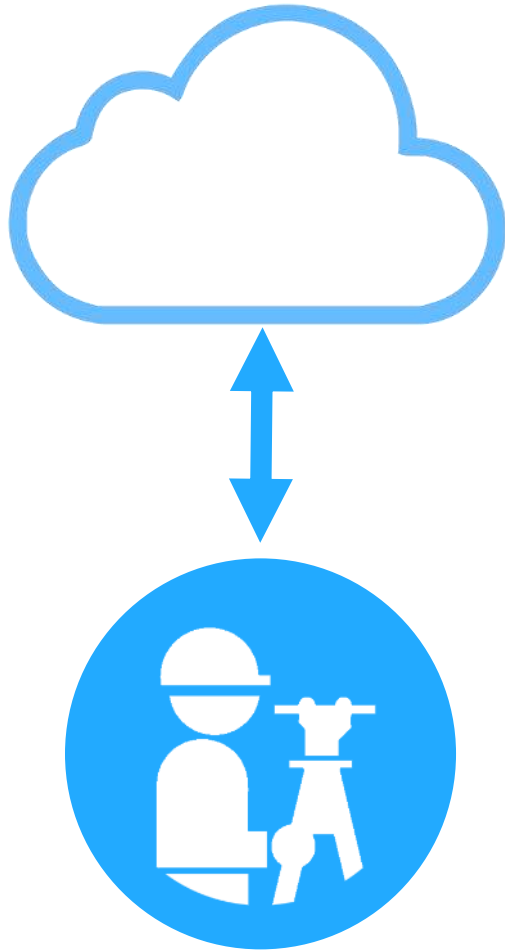
# Going Digital: Reality Modeling Advances *Surveying*, and Engineering...

PROJECT DELIVERY

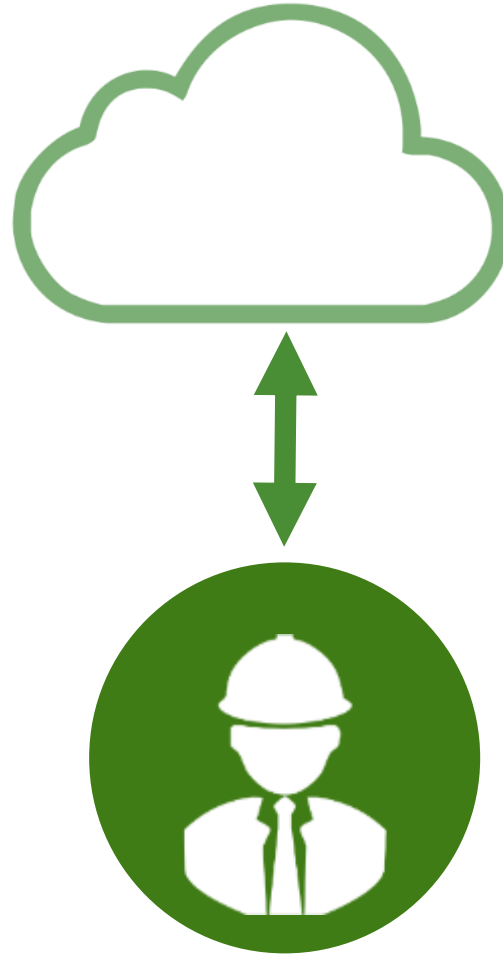




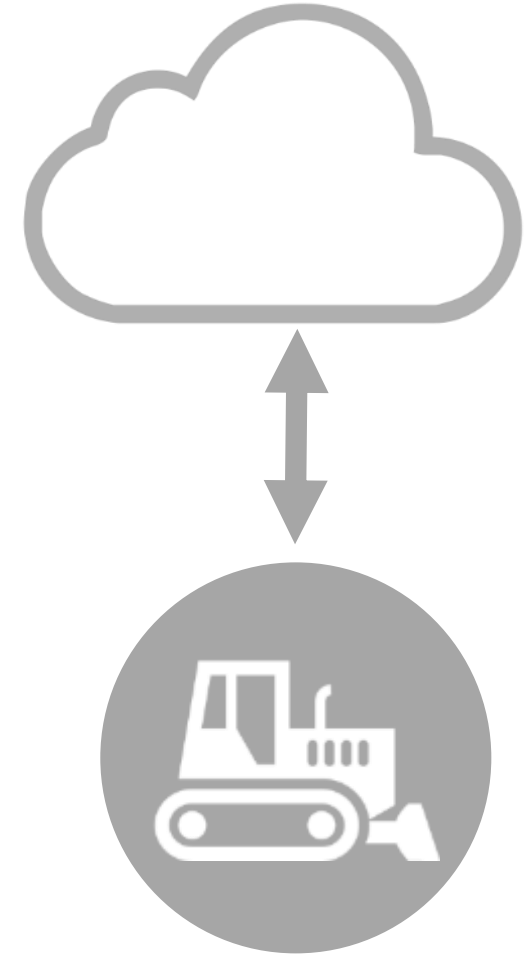
# Surveying



# Engineering



# Construction





# Constructioneering!







## **Bentley Systems and Topcon join forces to advance cloud services for 'constructioneering'**

*Engineers' connected data environments will span survey and construction processes for comprehensive project delivery benefits*

LONDON – The *Year in Infrastructure* 2016 Conference – 2 November 2016 – Topcon Positioning Group, a world leader in positioning instruments for survey and construction, and Bentley Systems, a leading global provider of comprehensive software solutions for *advancing infrastructure*, today announced their joint intentions to connect cloud services for *constructioneering*. During the keynote presentations, the companies' CEOs presented new construction workflows designed to increase efficiency and productivity with enhanced integration between their respective cloud services.

Each company will bring to market cloud-based solution offerings, which include services of both and provide construction workflows not previously possible. Initially, Bentley Systems will



**Ray O'Connor**  
CEO, Topcon Positioning Systems  
Year in Infrastructure  
November, 2016











Bentley®



**OpenRoads Designer**  
CONNECT Edition

10.00.00.112

Protected by US and international copyright laws as described in "Help About"  
Copyright (c) 2017, Bentley Systems, Inc.



File Home View Attach Analyze Retouch Extract Deliver Help

Attributes: None, Default

Primary: Reality Model Presentation, Section Tools, Attach Tools

View: Fit View, Window Area

Selection: Element Selection

Placement: Solid By Profile

Manipulate: Move, Copy, Rotate

Geographic: Coordinate System

Search Ribbon (F4) Sign in

Rotate View

Method: Dynamic

View 1, Default

Properties Explorer



Default

2 | 3 | 4 | 5 | 6 | 7 | 8

0.000

N 90°00'00.0" E

Z 690.265



# Going Digital: Reality Modeling Advances *Surveying*, and Engineering...

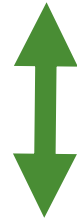




# Surveying



# Engineering

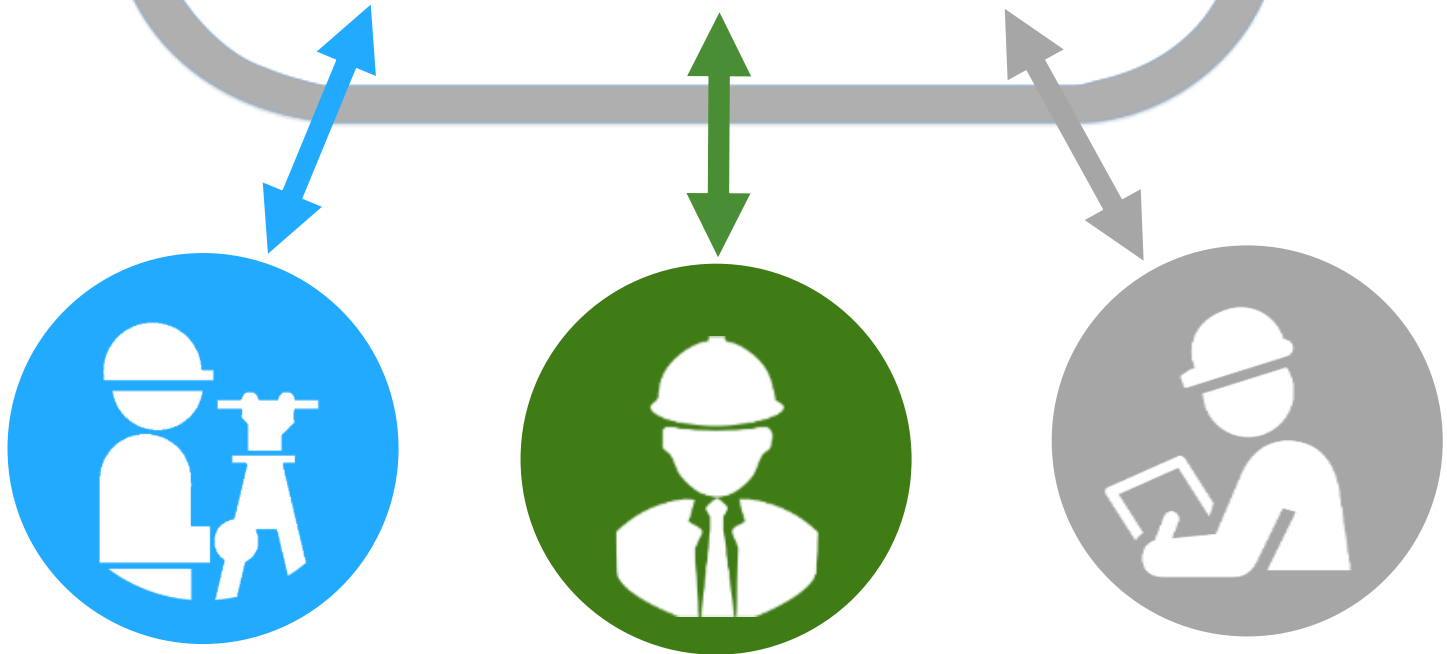


# Inspection

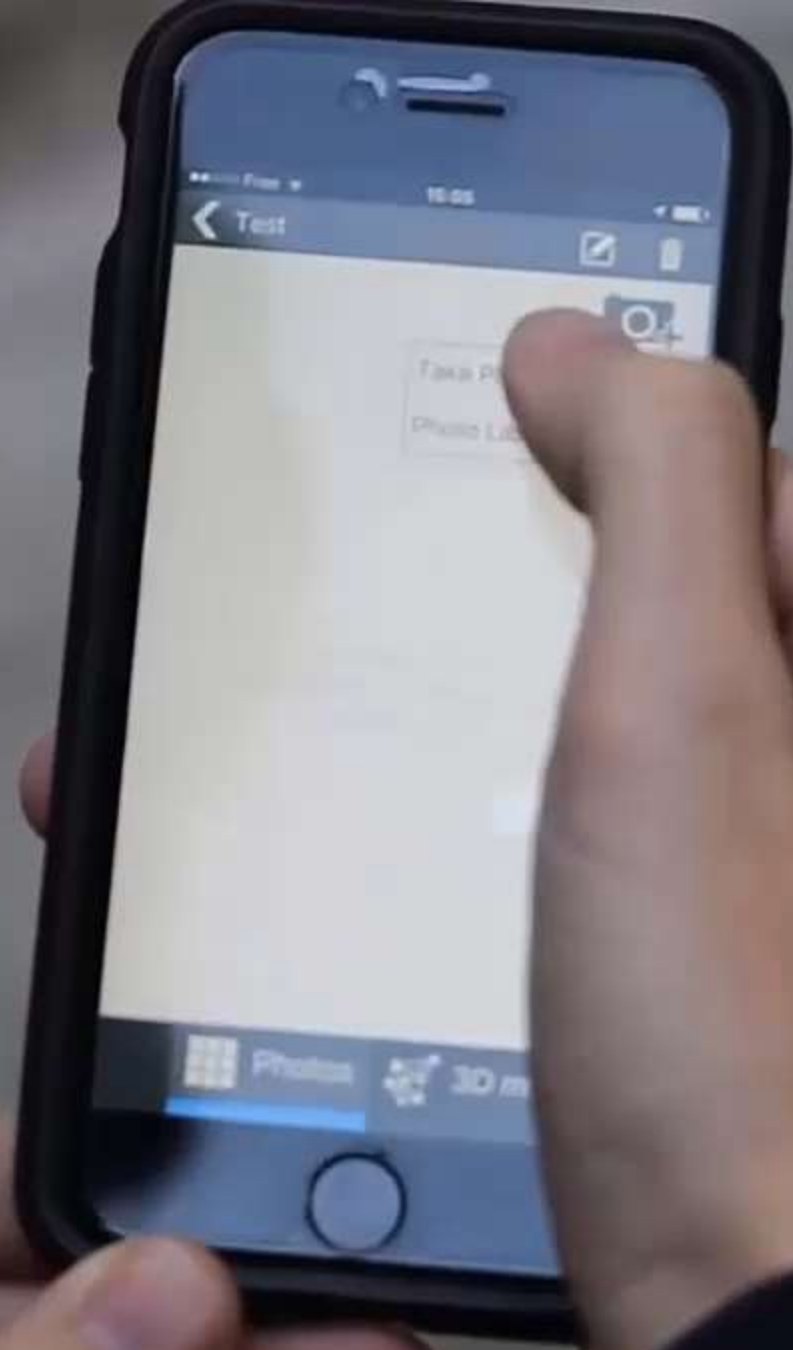




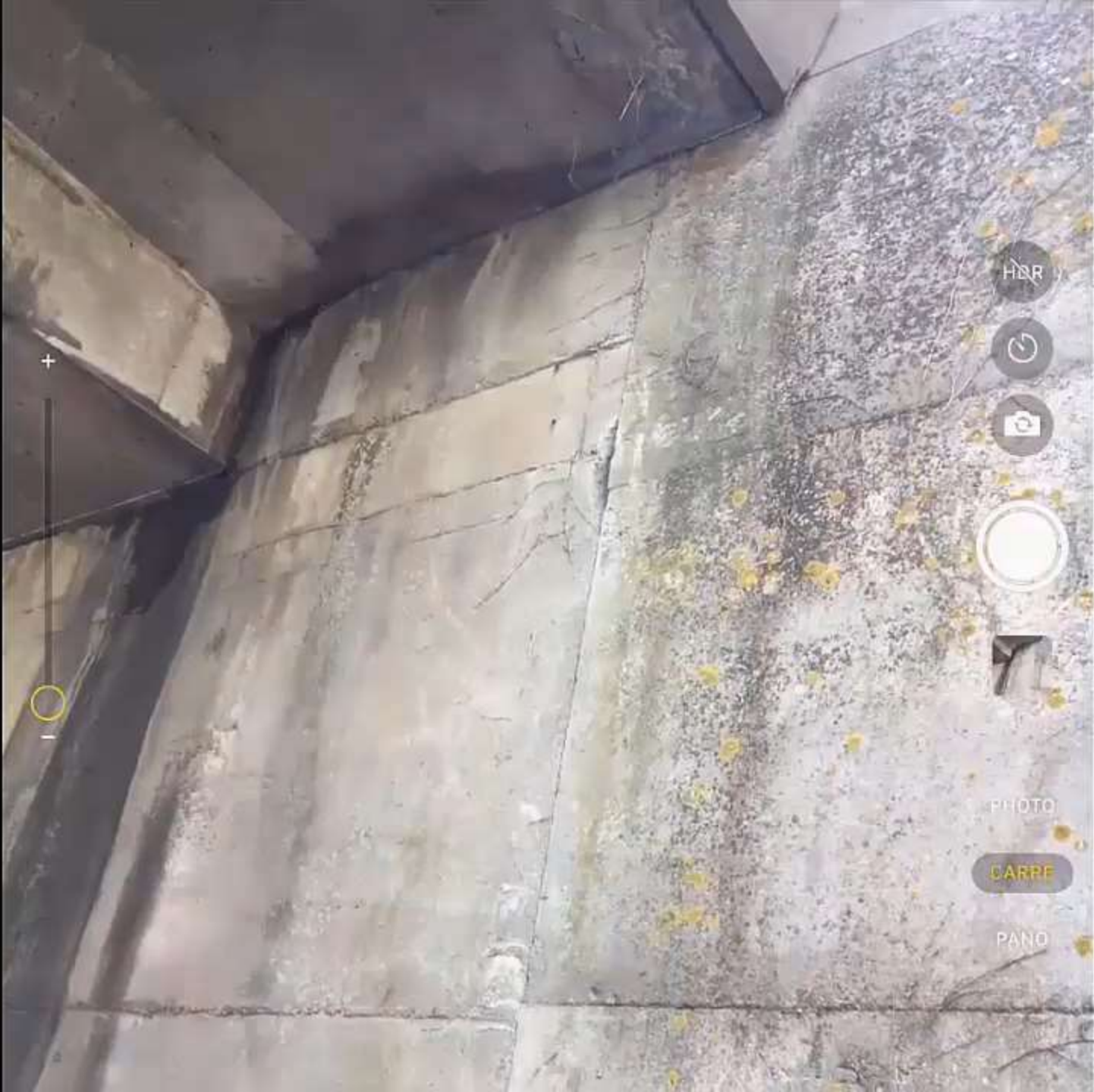
# Inspectioneering!











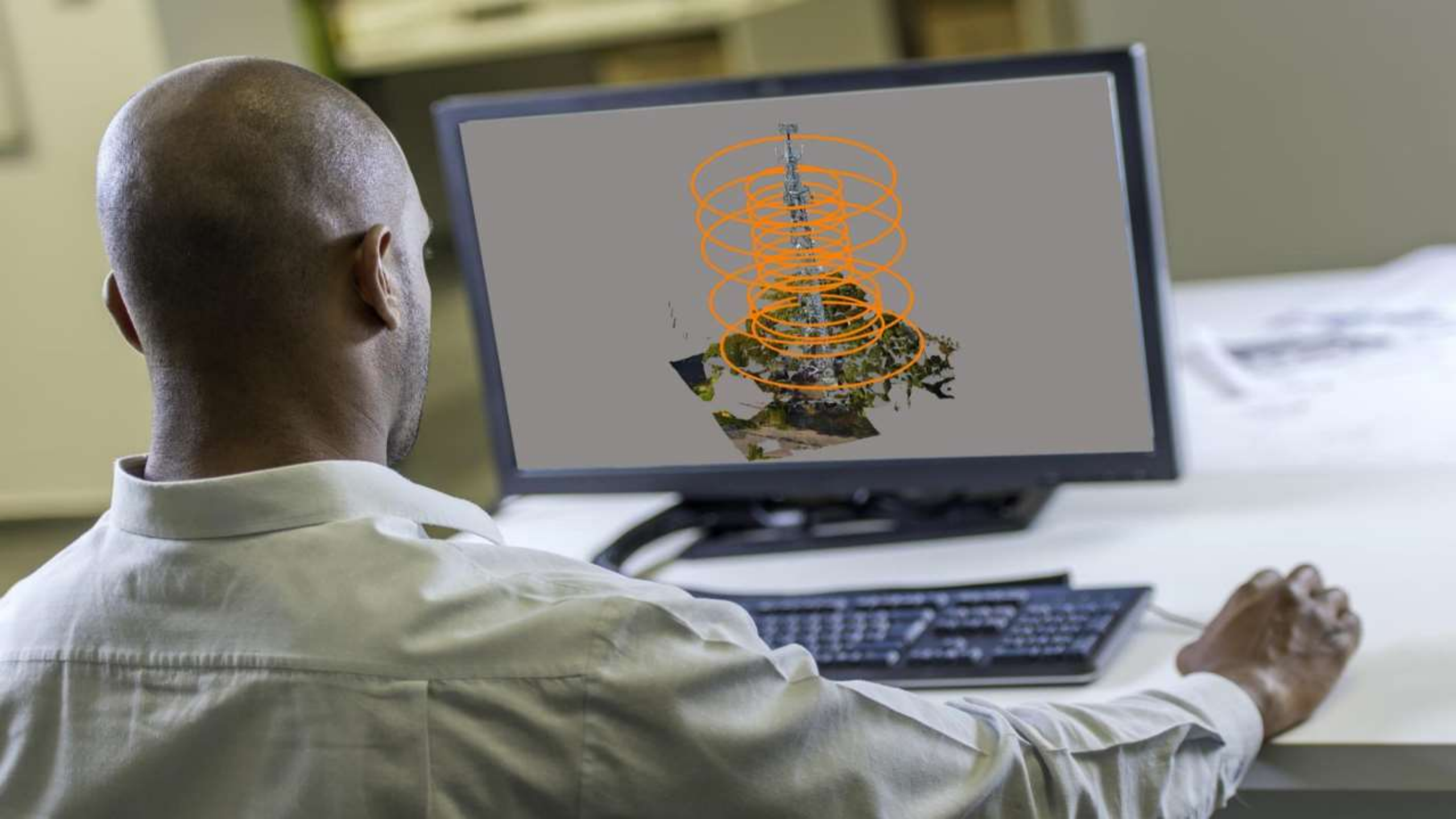












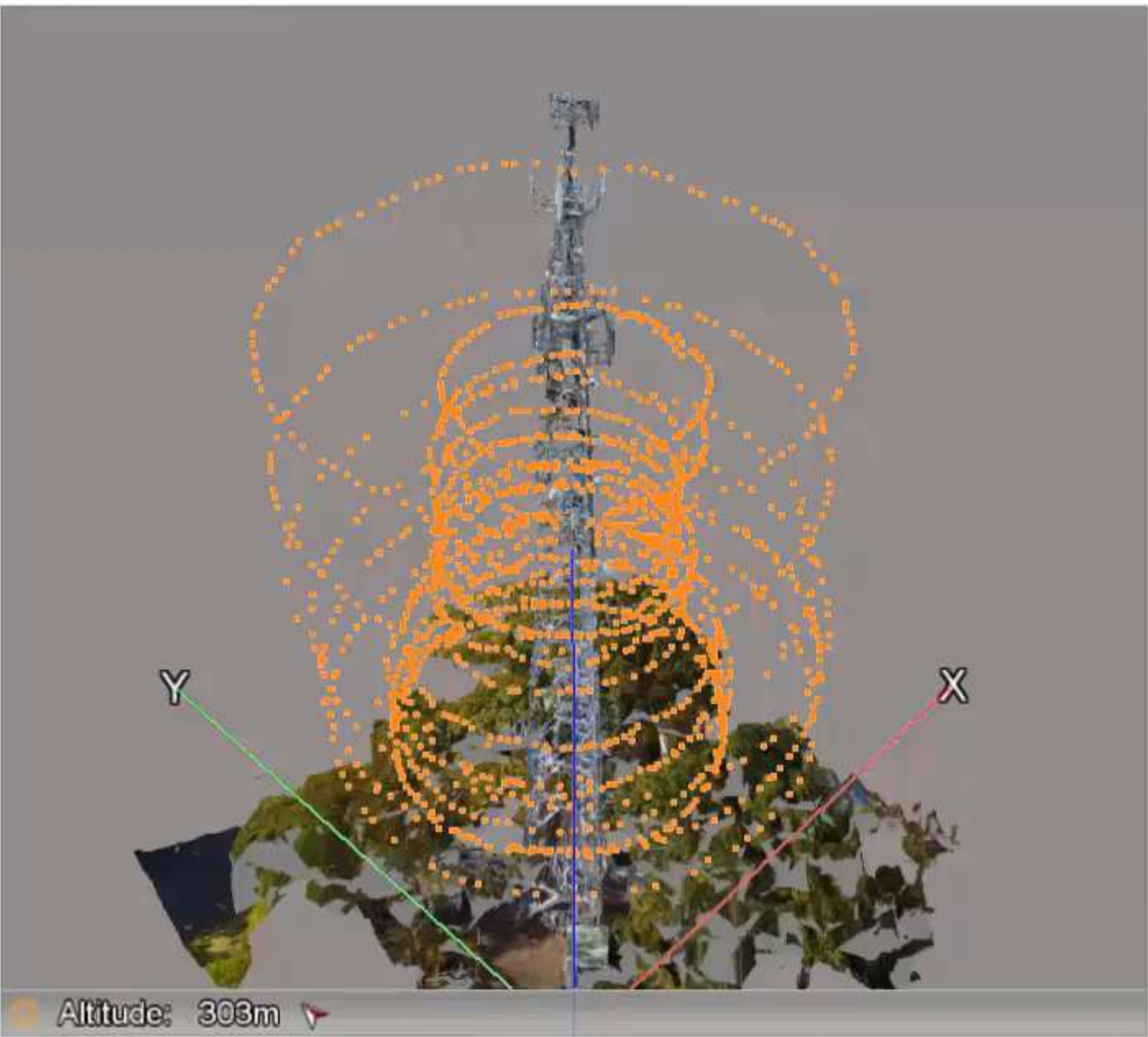




Show photos

Without component

Camera size



Altitude: 303m



Photo

Name

Directory

Date taken

Size

Mask file

Component

Pose

Spatial reference system:

WGS 84 (EPSG:4326)

Position X

Y

Z

Rotation



AERO LENS



# Going Digital: Reality Modeling Advances *Surveying*, and Engineering...





# Surveying



# Engineering

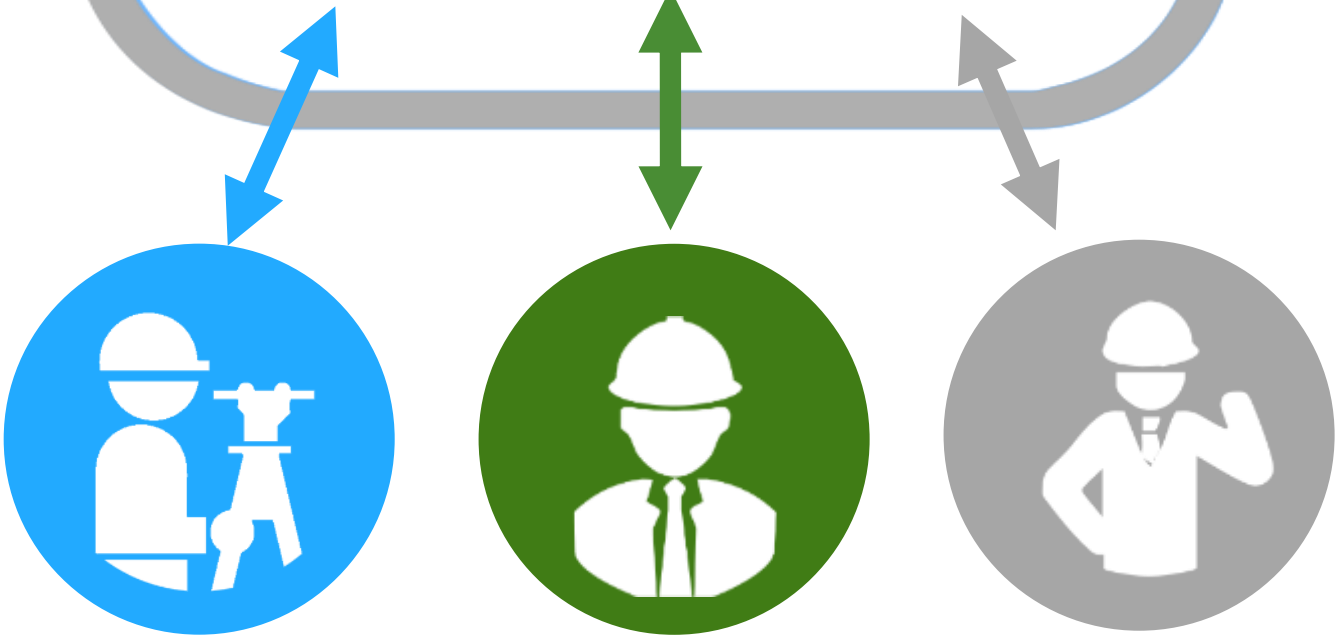


# Production





# Productioneering!





# Reality Modeling, GIS & BIM Enabled Facility Operations

## Virtual Penn State



**John Messner, Ph.D.**

Charles and Elenor Matts Professor of Architectural Engineering  
Director, Computer Integrated Construction Research Program  
Penn State



# Making It Real



2,400 + Photos — 2 hours to Capture





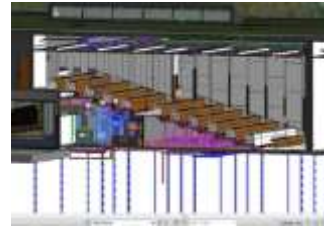
PennState



Financial



Design Models



Construction Models



Project Management



Space Management



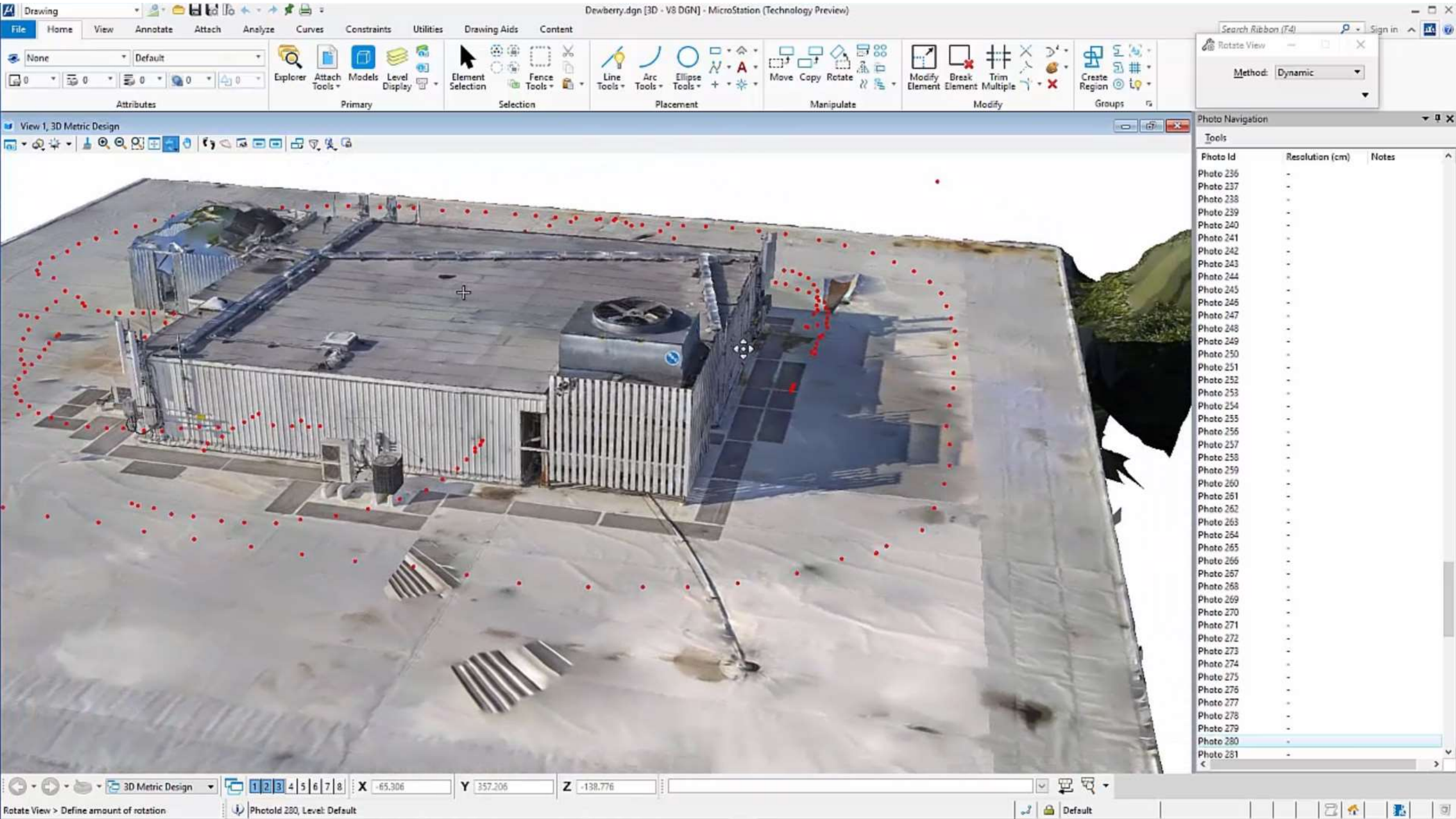
Maintenance Management



GIS

Office of Physical Plant Enterprise Data Sources





Search Ribbon (F4)  Sign in

Rotate View

Method:

Photo Navigation

Tools

Photo Id	Resolution (cm)	Notes
Photo 236	-	
Photo 237	-	
Photo 238	-	
Photo 239	-	
Photo 240	-	
Photo 241	-	
Photo 242	-	
Photo 243	-	
Photo 244	-	
Photo 245	-	
Photo 245	-	
Photo 247	-	
Photo 248	-	
Photo 249	-	
Photo 250	-	
Photo 251	-	
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Photo 274	-	
Photo 275	-	
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Photo 278	-	
Photo 279	-	
Photo 280	-	
Photo 281	-	

3D Metric Design  1 2 3 4 5 6 7 8 X -65.306 Y 357.206 Z -138.776

Rotate View > Define amount of rotation  Photoid 280, Level: Default  Default



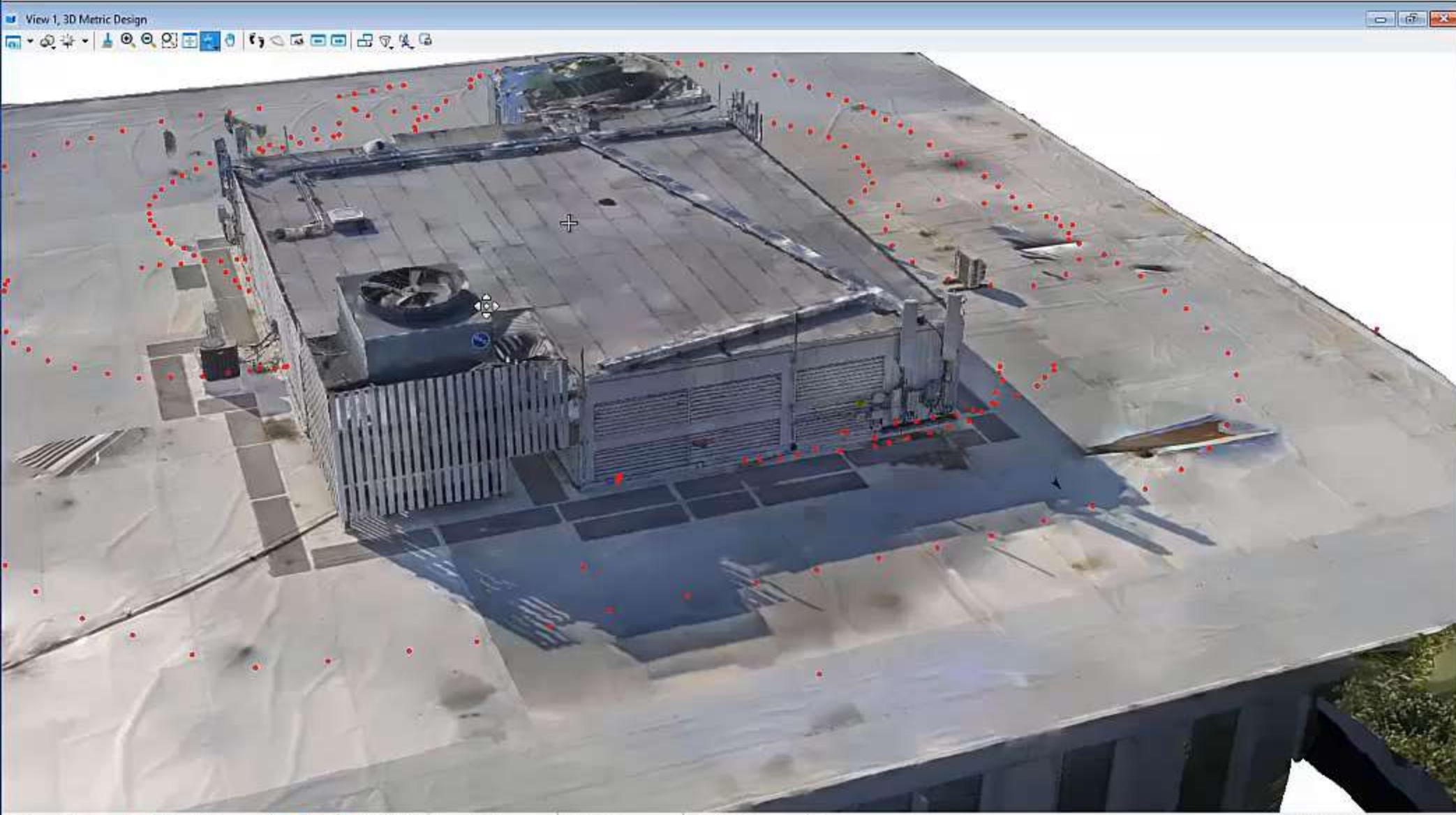
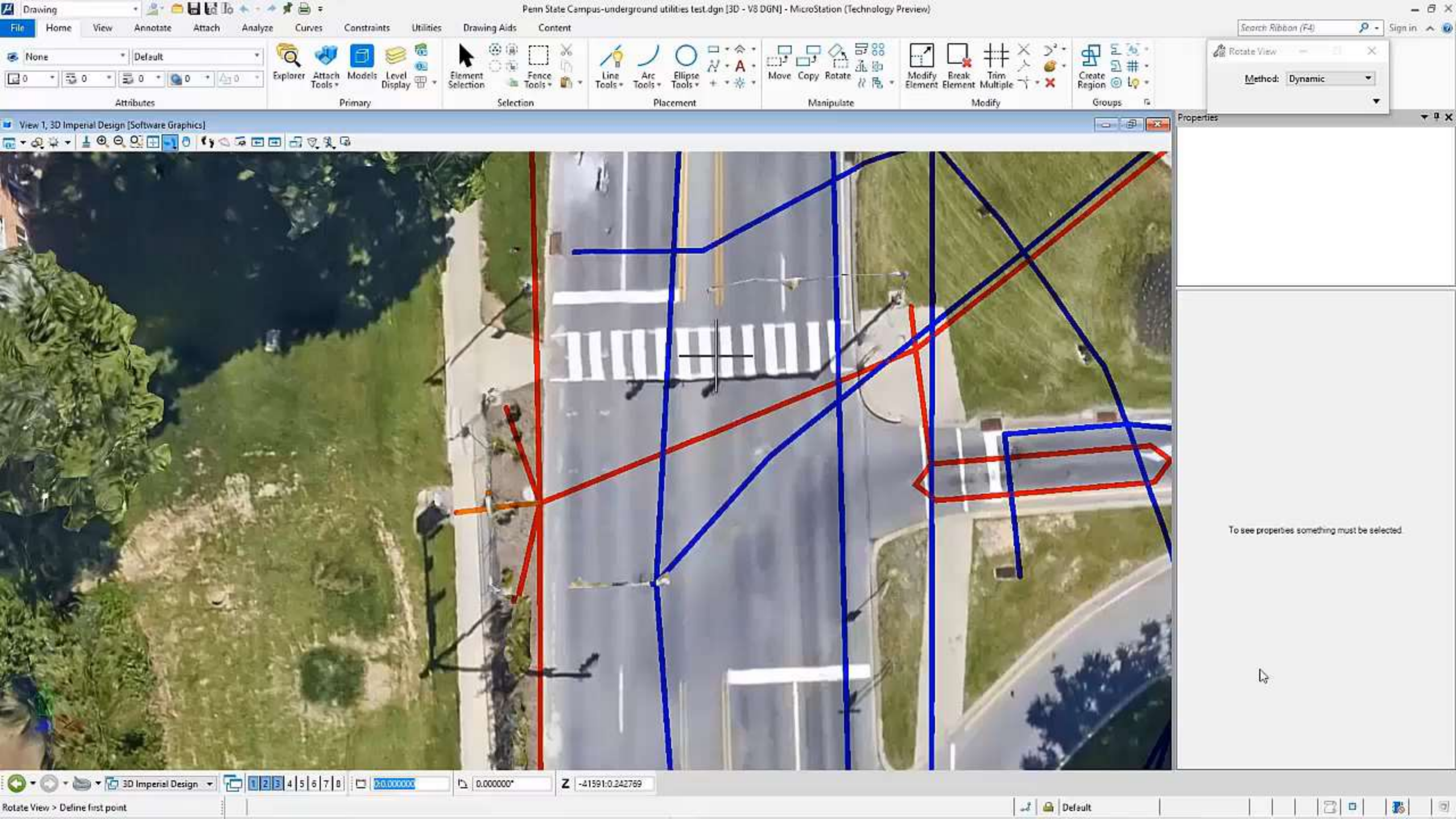


Photo Navigation

Tools

Photo Id	Resolution (cm)	Notes
Photo 236	-	
Photo 237	-	
Photo 238	-	
Photo 239	-	
Photo 240	-	
Photo 241	-	
Photo 242	-	
Photo 243	-	
Photo 244	-	
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Photo 277	-	
Photo 278	-	
Photo 279	-	
Photo 280	-	
Photo 281	-	













Classifier: 'WO+Resources-Linked'  
Shape  
Level: PSU\_OPP\_Buildings2016  
File: I:\Gridropbox\Consulting Projects\Bentley 2015\Reality Modeling\Projects\Penn State\Integration-Work Orders.i.dgn\Penn State Campus-Work Orders-Resources Linked.i.dgn\1 - Buildings-WorkOrders-Resources-linked.i.dgn

Properties

To see properties something must be selected.

Explorer

Items

Search

- MaximoWorkOrders
- PSU\_OPP\_Buildings2016
- WorkTypeResource

Sheet Index

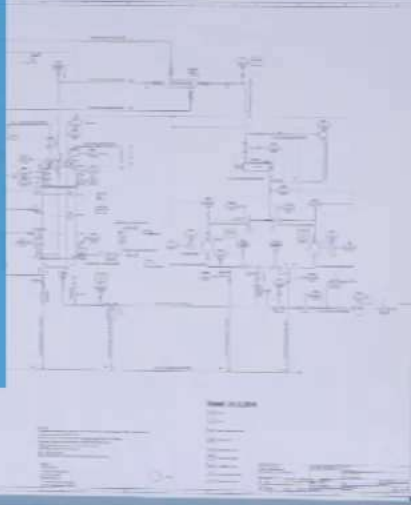
Links







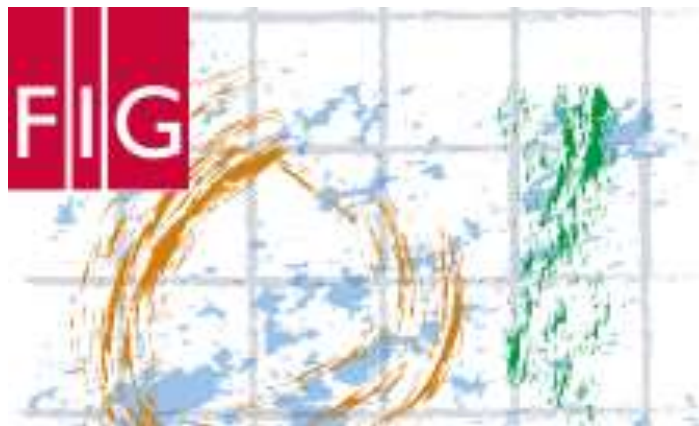
# Four Steps to the digital twin







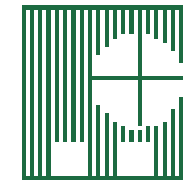




# FIG WORKING WEEK 2017

Surveying the world of tomorrow –  
From digitalisation to augmented reality

May 29 - June 2 **Helsinki Finland**







Microsoft  
HoloLens





# Going Digital: Reality Modeling Advances...



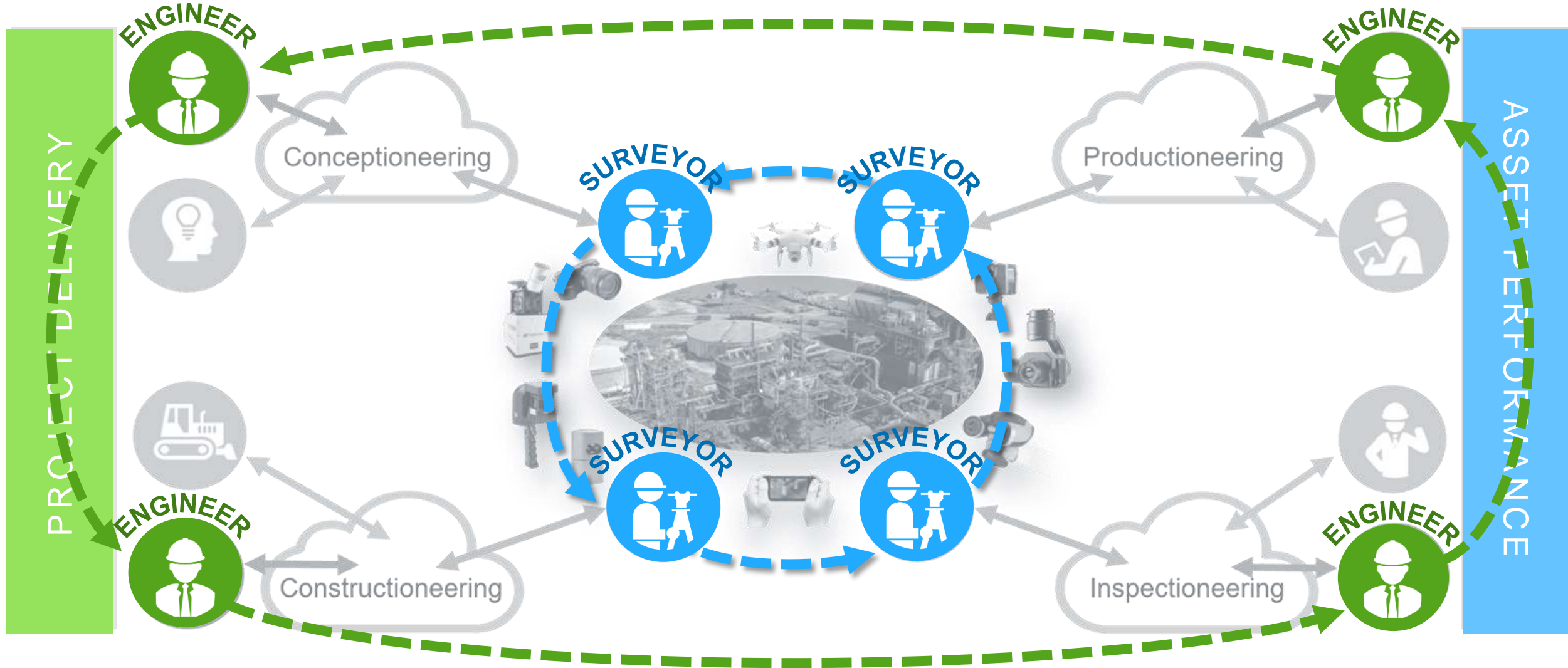


# Going Digital: Reality Modeling Advances Engineering...





# Going Digital: Reality Modeling Advances Surveying and Engineering!







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[Key Personnel](#)

[Projects & Experience](#)

[Partnerships](#)

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How can we Help You with your surveying, 3D modelling or mapping requirements?

[Contact Us](#)

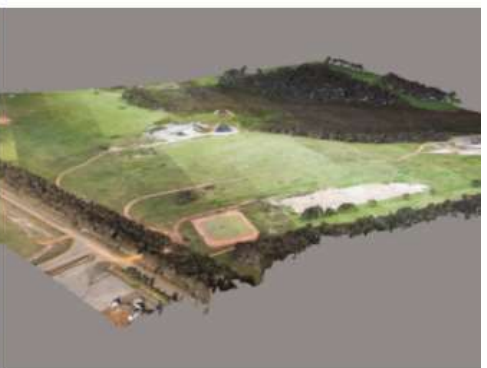






# Projects & Experience

A sample of our latest work



Interested in discussing how we can help with your next project?

Contact Us









# Projects & Experience

A sample of our latest work



Interested in discussing how we can help with your next project?

[Contact Us](#)





The Great Southern Motorplex Group are working towards establishing a world class motorplex in the Albany region. After securing a suitable location the working group required a complete survey of the stage 1 region to begin the planning. Albany Mapping & Surveying Services deployed its UAV Aerial Mapping system to collect high accuracy data over the whole 100ha area in a single morning. The collected data was then processed to produce a 3D reality Model, Contour & Feature Survey, DEM (Digital Elevation Model) and strung digital model. This data can now be used for preparing detailed engineering design and 3D concept plans and presentations.

Inspect the 3D Reality Model below (click and drag) or the full screen model [here](#).



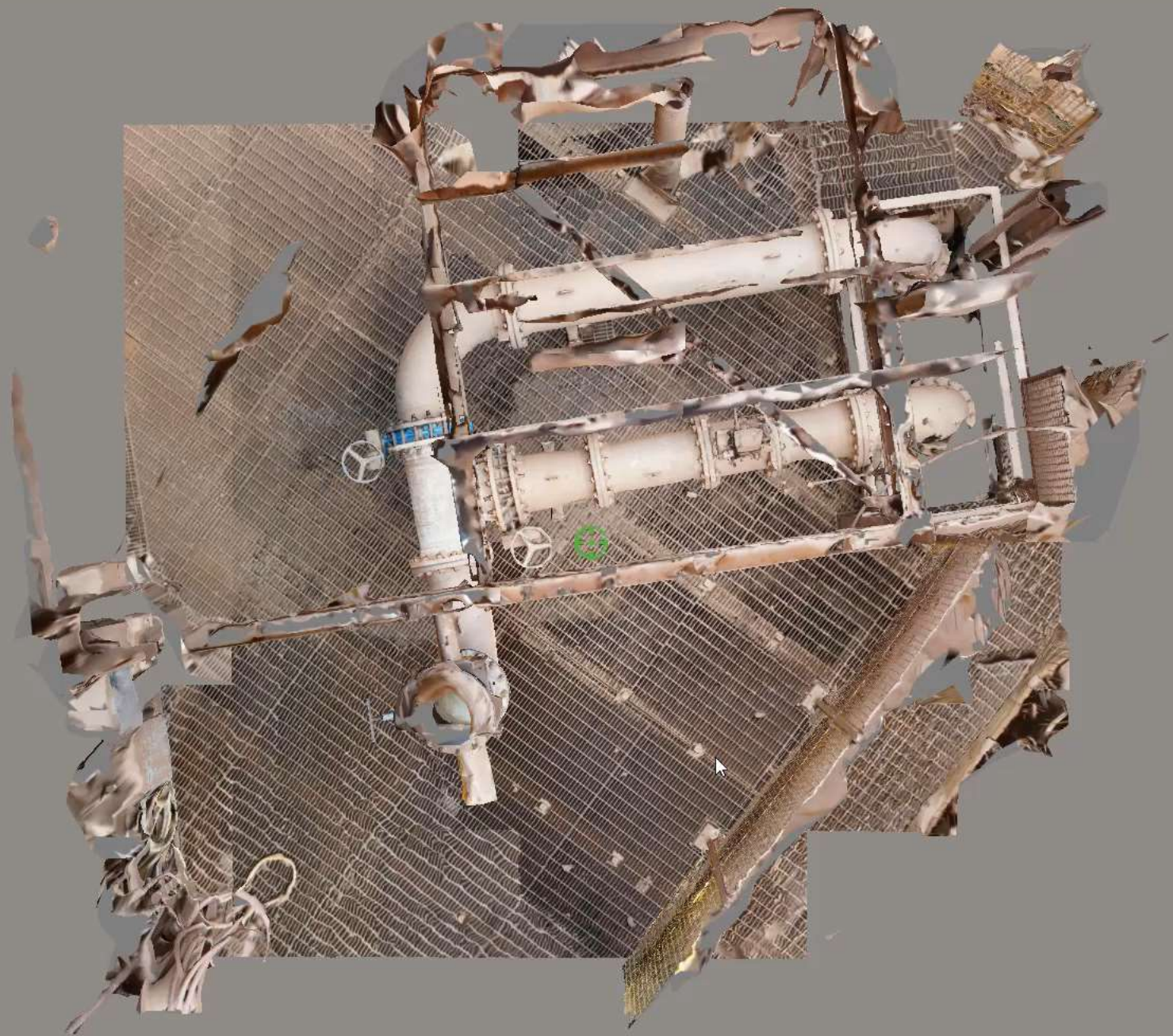


**Sent:** Saturday, 27 May 2017 4:01 AM

“...We are currently preparing a quote to complete image capture (and preferably also processing) of the complete [REDACTED] Refinery in high detail.

Please see below a very small sample of data we collected and processed. This is the result of only 56 images from the total 150 images collected of this pipe work. The total capture was 800 UAV photos and 3000 ground photos (captured in 5hrs). The final model promises to be stunning...”

***Christopher Stan-Bishop***  
*Surveyor / Partner*  
*B.Surv Hon, M. SSSI, M. WAIS*







Chris Stan-Bishop

*Business Partner/Surveyor*



“Our survey work has traditionally been limited to an initial survey prior to new works and a support role during construction.

With reality modeling, we have decreased our turnaround times, enhanced our deliverables and added new business which is ongoing and recurring through an asset’s continuous lifecycle.

End user clients are realizing significant cost savings causing an increasing demand for our services.”

# FIG 2017 *Working Week*...

Technical Session:

## **Bentley Map Meets Reality Modeling**

by Johannes Klick

When: **Wednesday, May 31, 11:00 am – 12:30 pm**

Where: **Room 208**

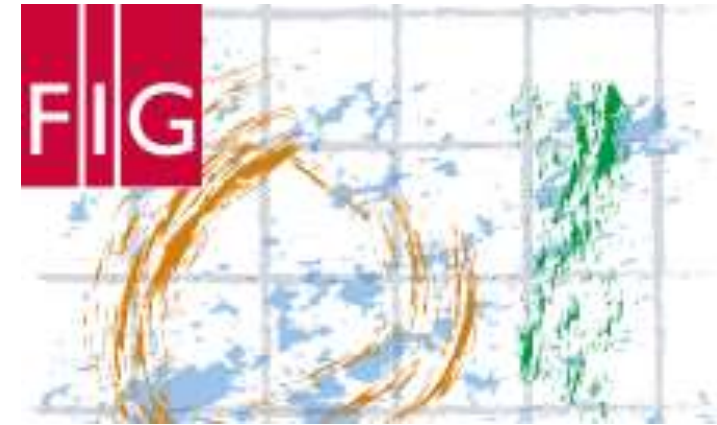
Product demonstration:

## **Reality Modeling Goes Mainstream**

by Aidan Mercer/Pascal Martinez

When: **Wednesday, May 31, 1:45 pm – 02:30 pm**

Where: **Exhibition Hall Stage**







INFORMATION AND EXHIBITIONS

# Laituri - Towards tomorrow's Helsinki

<http://laituri.hel.fi/info>

**Helsinki has become a metropolis! – Eliel Saarinen and Helsinki**

**Exhibition at Laituri: June 1 to September 16, 2017**







# *Going Digital:* Reality Modeling Advances *Surveying*, and Engineering...



May 30, 2017

**Bentley**<sup>®</sup>  
Advancing Infrastructure



# Reality Modeling Advancements (2018...)





# Machine-Learned Classification: Grass, Tree, Car

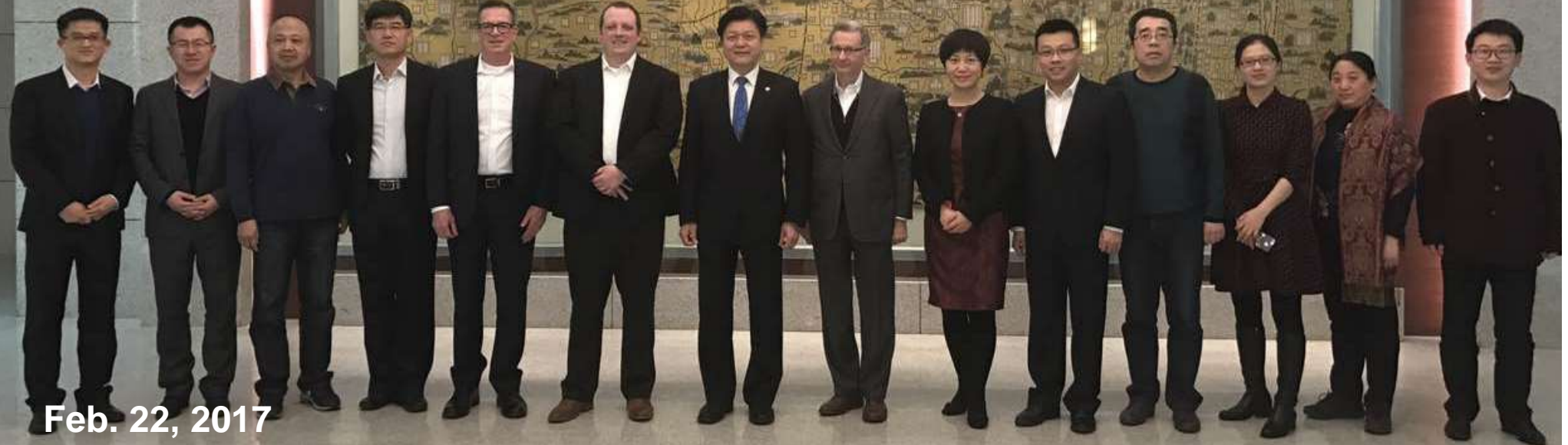






# NASG

National Administration of Surveying, Mapping and Geoinformation of China



Feb. 22, 2017

# Going Digital: Resolution “Provenance” ...



Exton building

100 photos



# Going Digital: Resolution “Provenance” ...

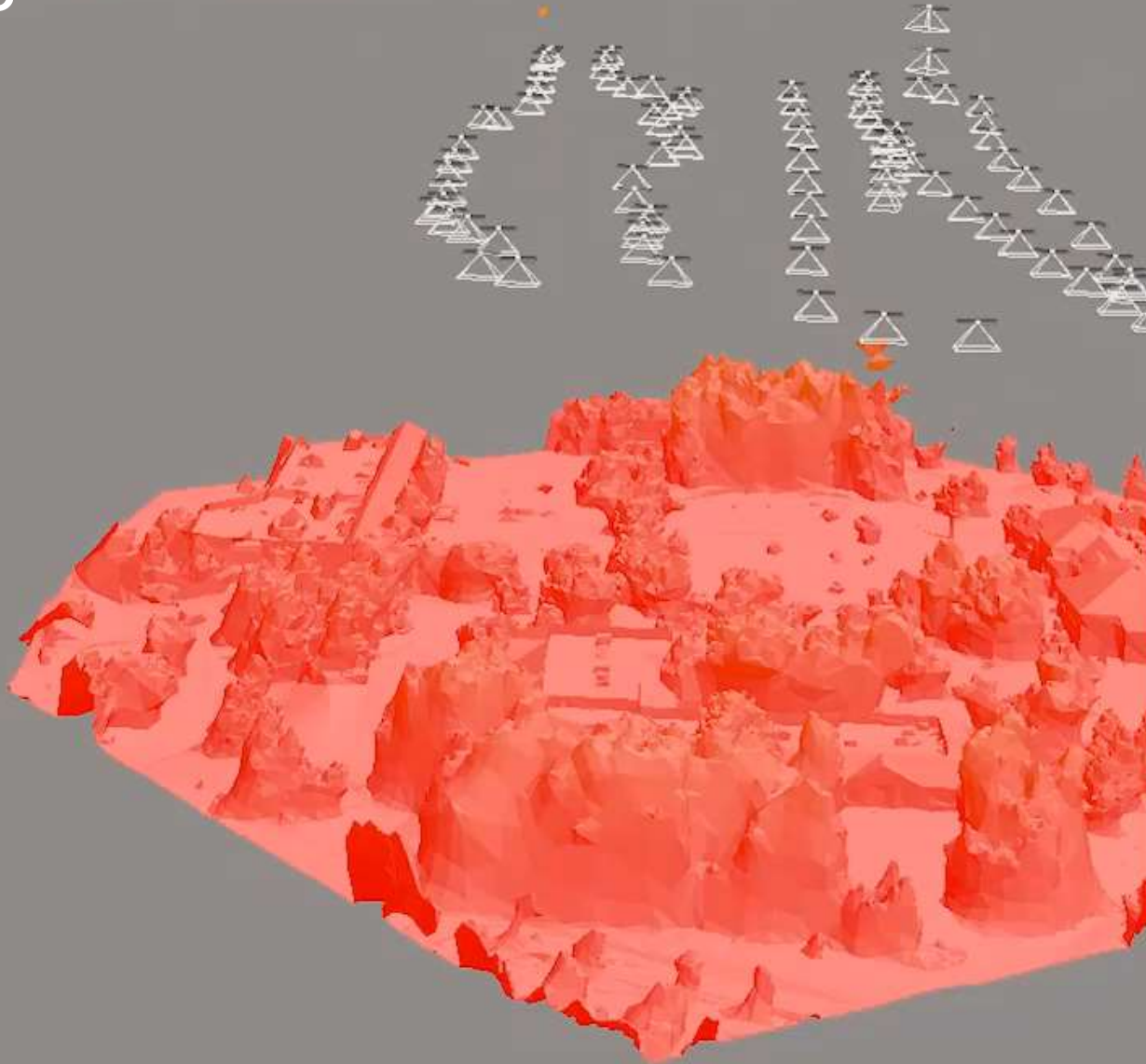
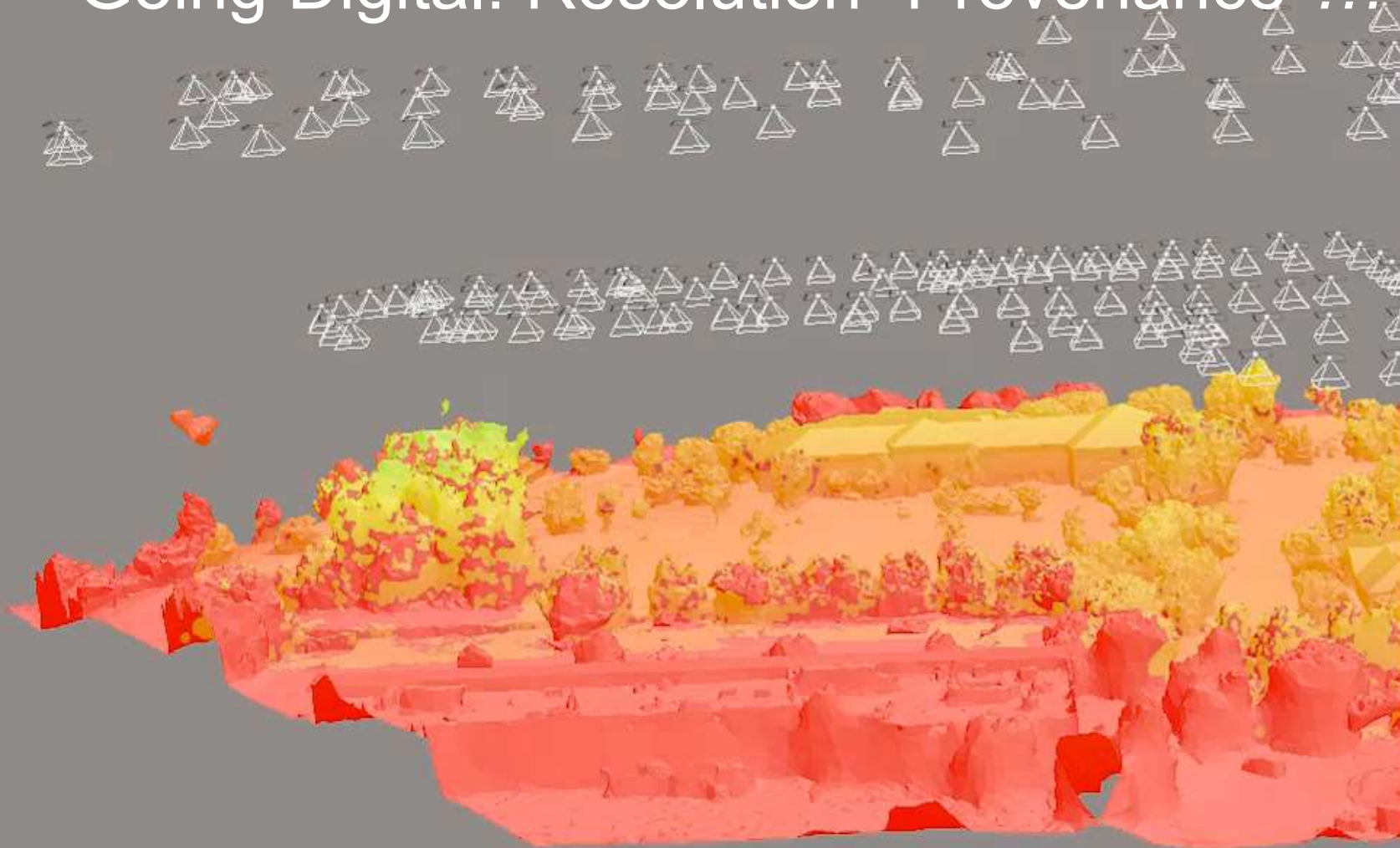


Photo resolution:  
From 35mm  
to 50mm per pixel  
from 15mm/pixel

# Going Digital: Resolution "Provenance" ...



+ 150 photos

Resolution:  
from 15mm/pixel



# *Going Digital:* Reality Modeling Advances *Surveying*, and Engineering...



May 30, 2017

**Bentley**<sup>®</sup>  
Advancing Infrastructure