



Immersive Interaction and Performance Simulation with MicroStation V8i (SELECTseries 3)

Chris Bober, Director of Product Management

The Bentley Advantage

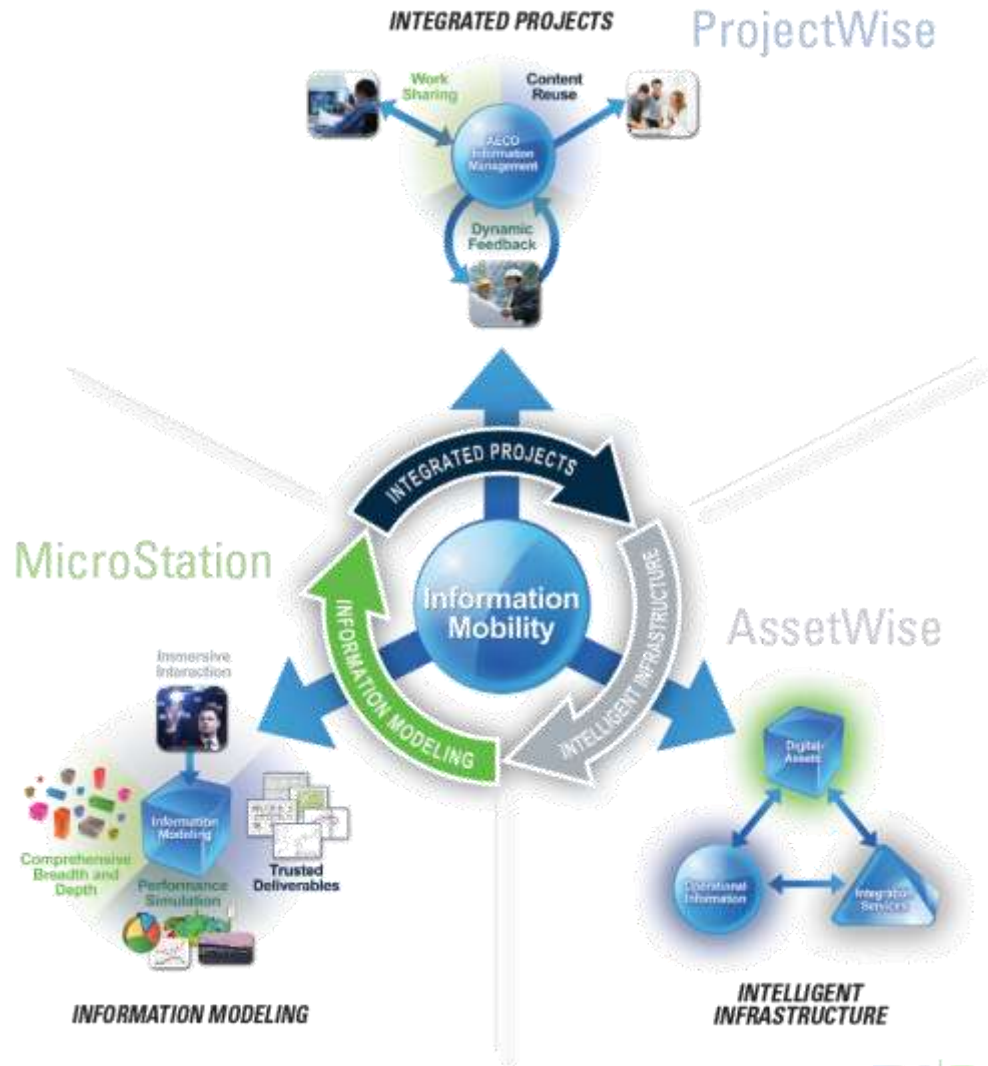
Information Modeling

through

Integrated Projects

for

Intelligent Infrastructure



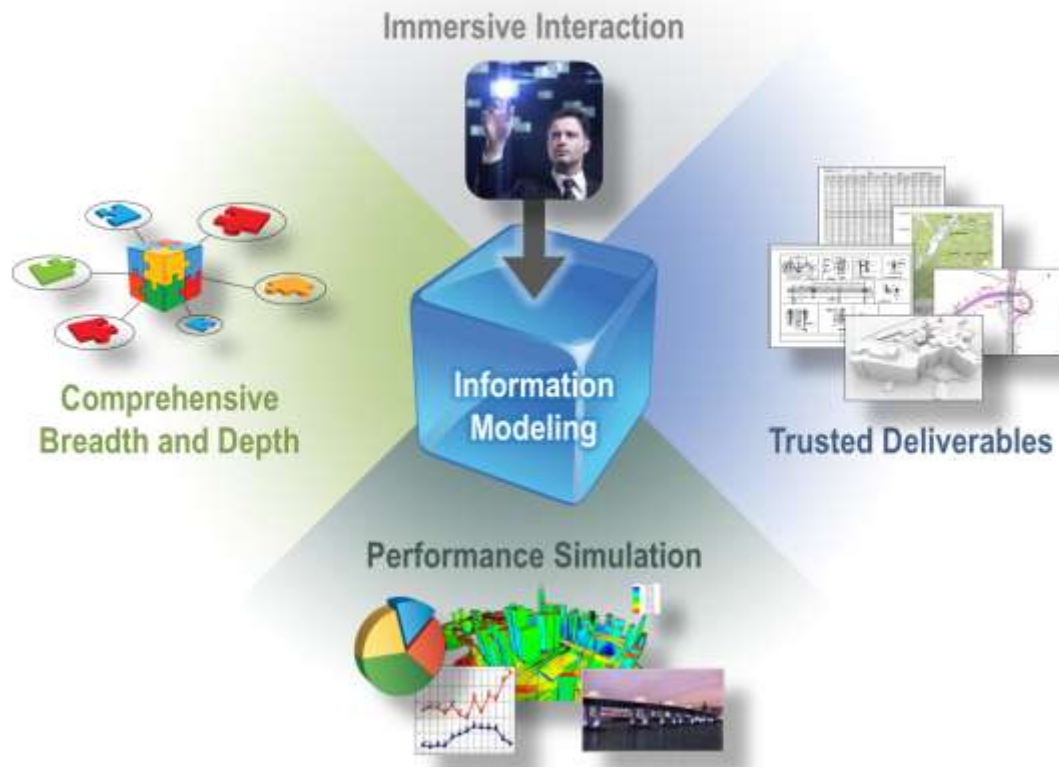
MicroStation®

An unrivaled **information modeling environment** for architecture, engineering, construction, and operations for all infrastructure types...



...that can be used as both a **software application** and as a **technology platform** for discipline-specific applications.

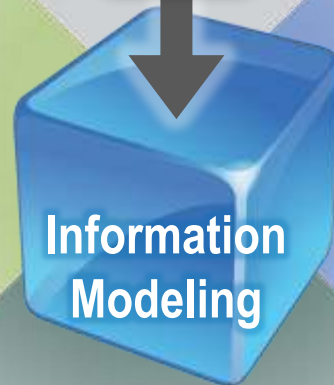
Advantages of Information Modeling



- Create 3D design, documentation, analysis and rigorous performance simulation – to explore options and maximize design objectives.
- A unifying production environment ensures the production of trusted deliverables that always reflect the latest changes.

MicroStation®

Immersive Interaction

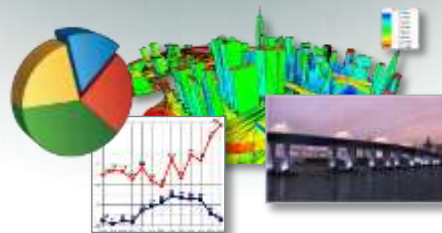


Comprehensive
Breadth and
Depth



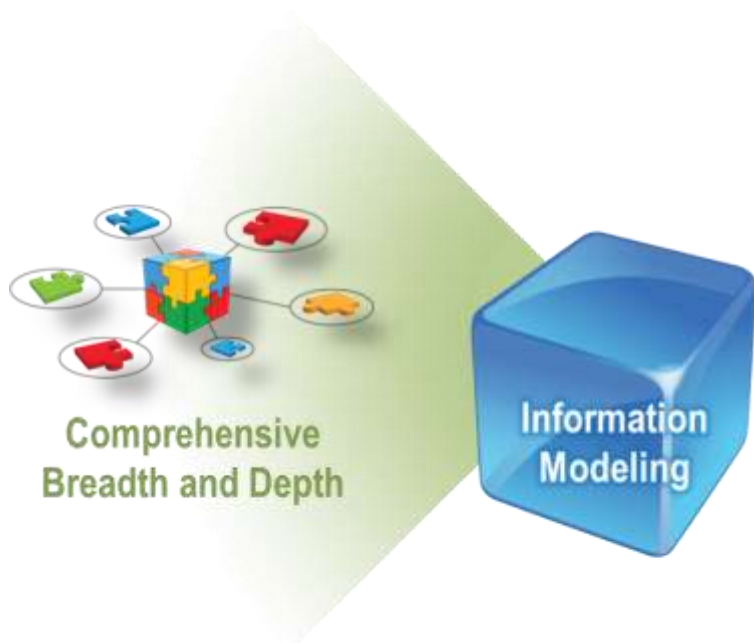
Trusted Deliverables

Performance Simulation



Comprehensive Breadth & Depth

- Unparalleled richness in geometry and information



Across the lifecycle

Any scale project

Distributed teams

Discipline-specific applications

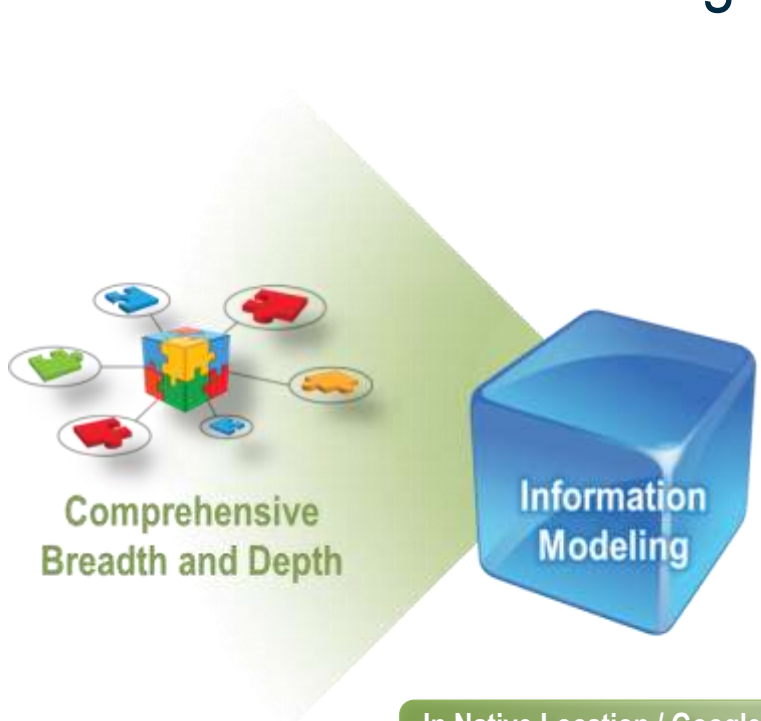
High rigor, detail and complexity

Reuse existing data

Regardless of format

Comprehensive Breadth & Depth

- Federation and integration of design data



Discipline-specific Rigor

| Geometry | |
|------------------|----------------------------------|
| Business Area | 25.9 |
| Secondary Area | 25.0 |
| Center | 1740352.4 1/2.696726 5 3/4 85.4 |
| Start Angle | 0° |
| Isometry Angle | 33.74° |
| End Angle | 33.74° |
| Angle | 60.00° |
| Orientation | Bottom |
| Primary Vector | 6.8 3/8 -11.1 1/2.0 0 |
| Secondary Vector | -15.1 1/2.64 376.0 0 |
| Start Point | 1740352.2 1.6 6.96794 3 3/4 85.4 |
| End Point | 1740350.8 6.96794 10 3/8 85.4 |
| Units Ratio | 1.00000 |
| Named | 0 0 -1.00000 |
| Length | 15.1 3/8 |
| Area | 11 |

Appropriate for the Task



Large & complex or typical

In a Pragmatic Way

In Native Location / Google-Like

Rhino

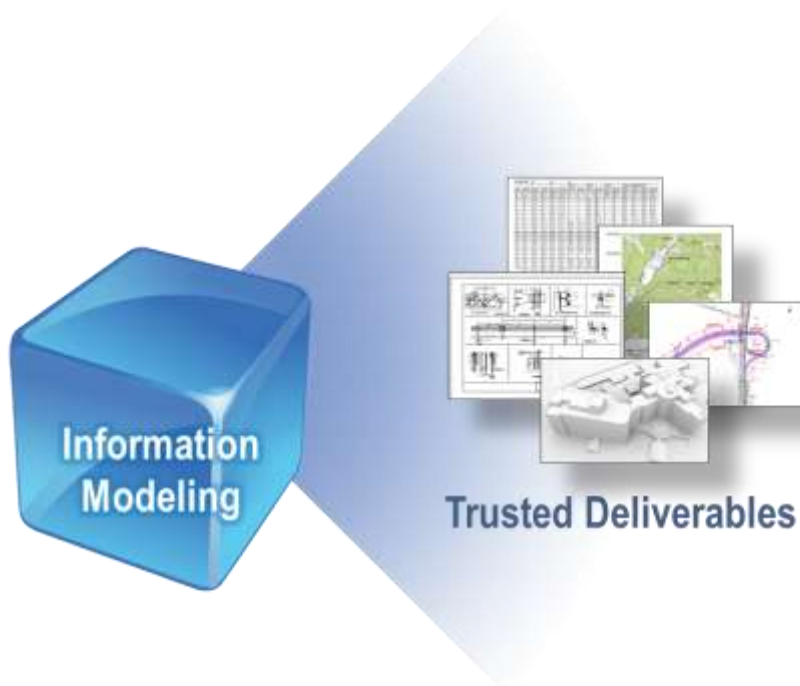
SketchUp

DGN

DWG

Trusted Deliverables

Confidently act on deliverables



Reliable

Fit for purpose

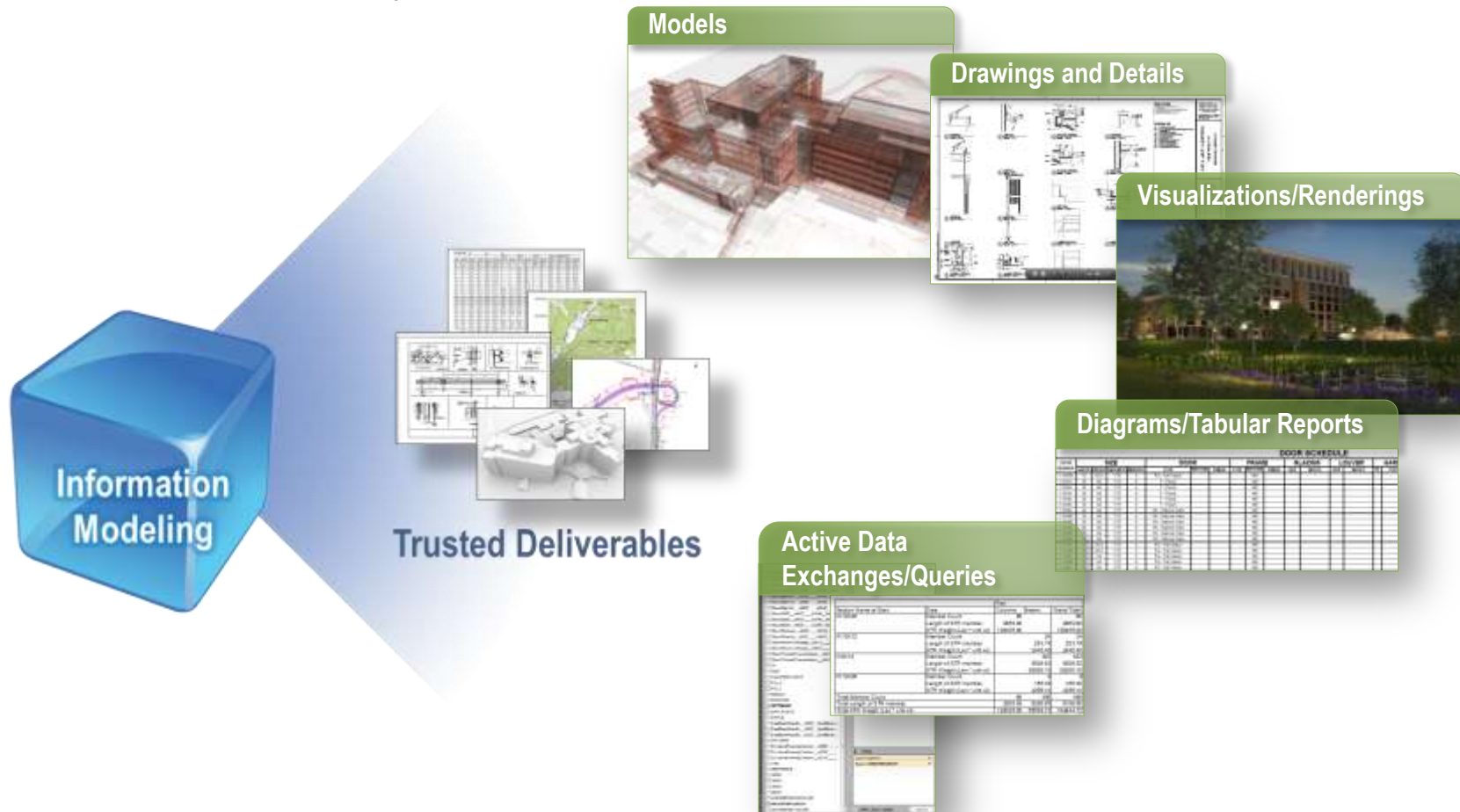
Reflecting latest revisions

Throughout work in progress

Changes intrinsically represented

Trusted Deliverables

Integrated representations that reflect the same design model simultaneously with all the characteristics appropriate for each



Immersive Interaction

- Understand and interact with all available design information and leverage it in real-time

Immersive Interaction



Completely Fulfilling Requirements

Providing broader awareness

Ensuring design, construction and operational decisions

Immersive Interaction

Hypermodeling enables interrelated design information to be presented directly within spatial context of the 3D model

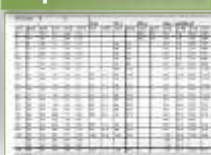
Immersive Interaction



Drawings



Specifications



Images



Business Data



Web Content



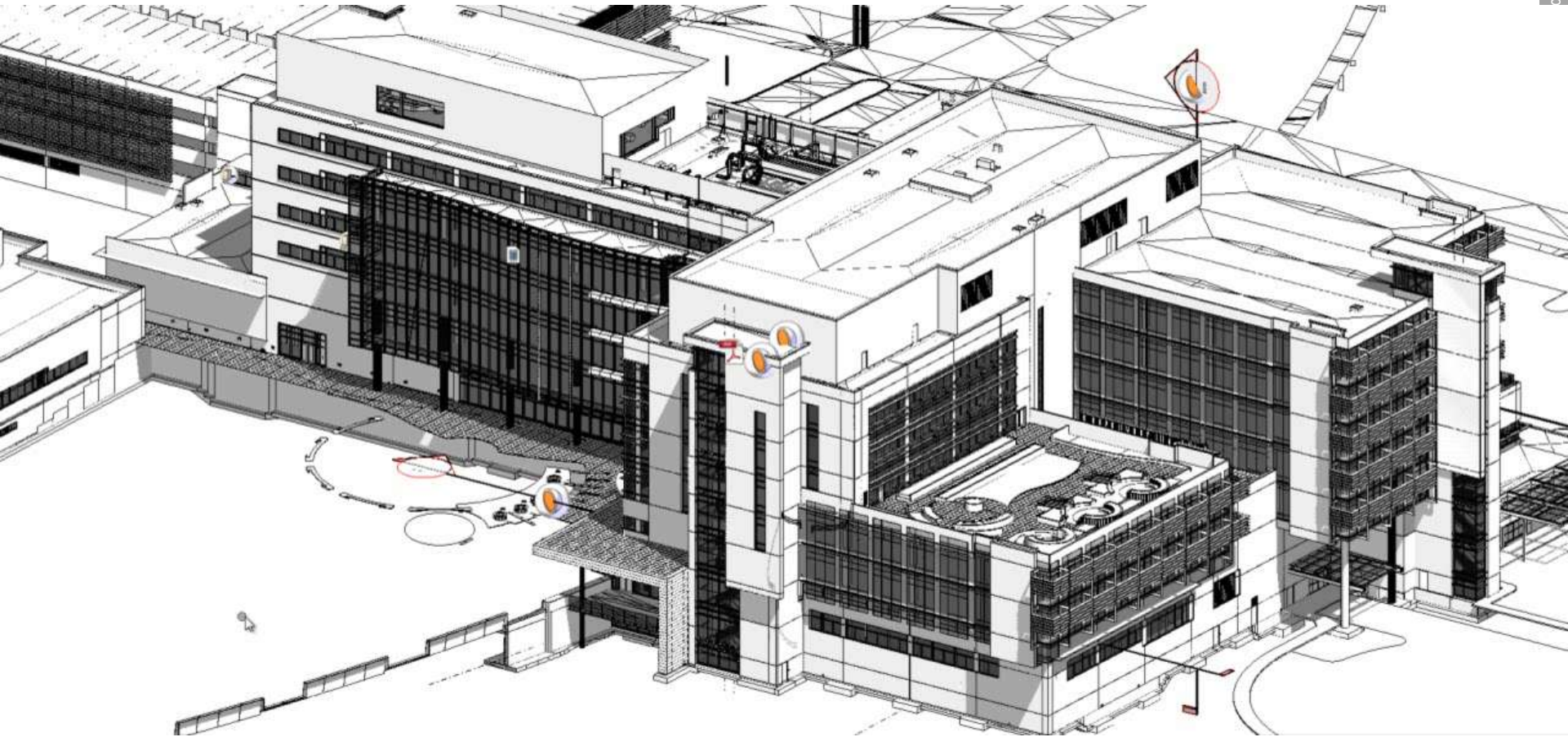
Animations



Videos



Hypermodels

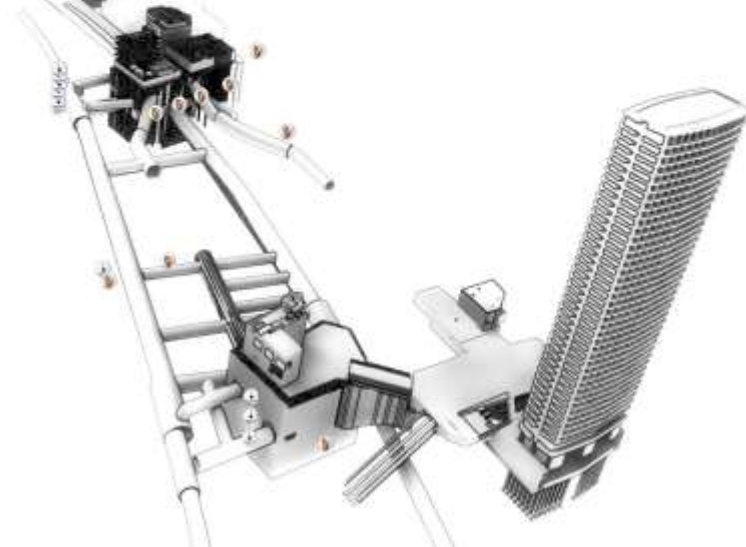
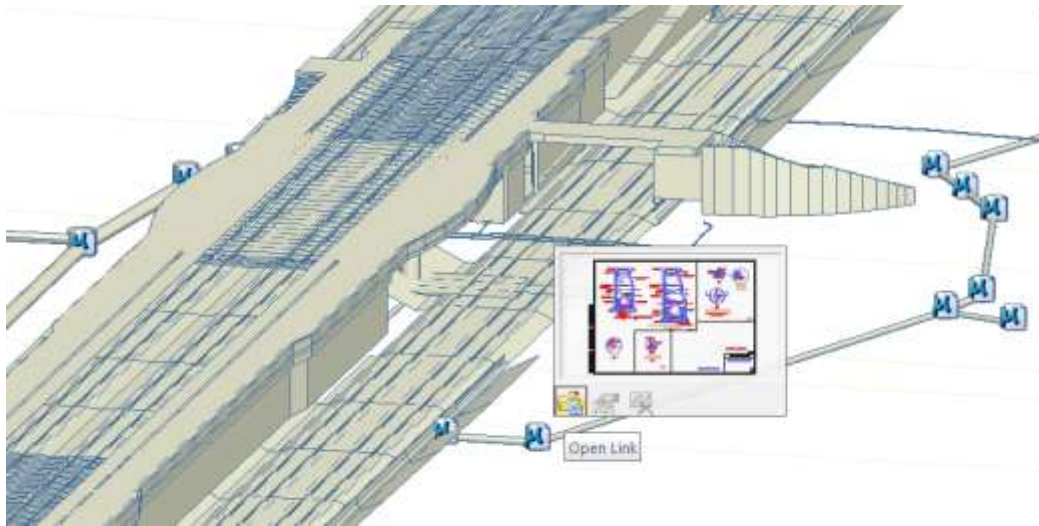
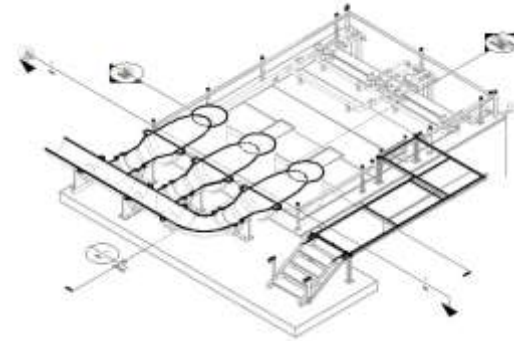
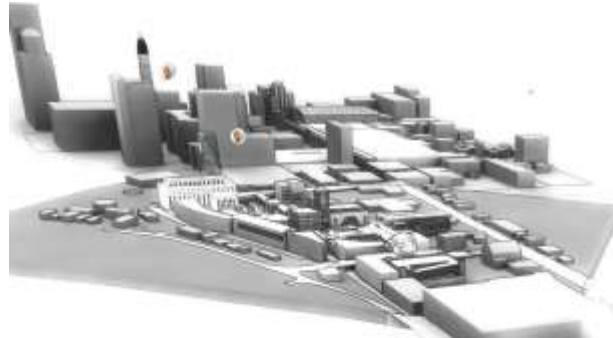
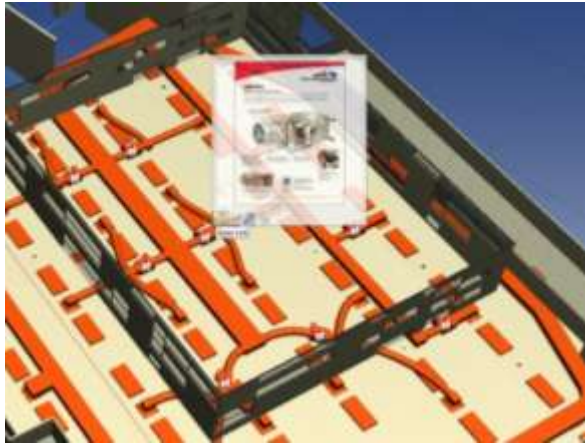


Hypermodel Dataset
courtesy of: **Nemours Children's Health System in Orlando, Florida**
Stanley Beaman & Sears Architecture and Interiors in Atlanta, Georgia
Perkins + Will Architects

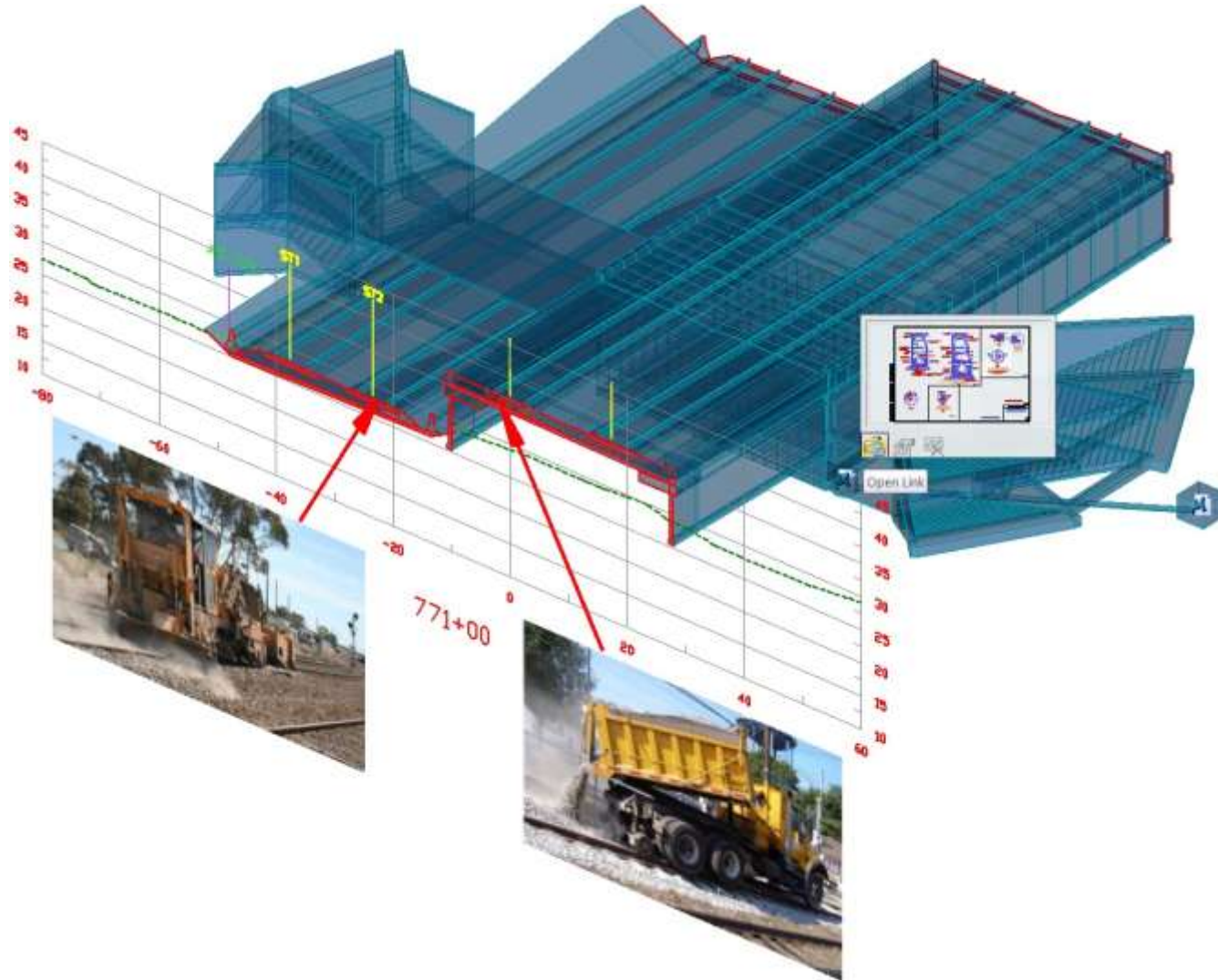
Hypermodels Across Industries



Incorporated



Hypermodels in Construction and Operations



Item Sets

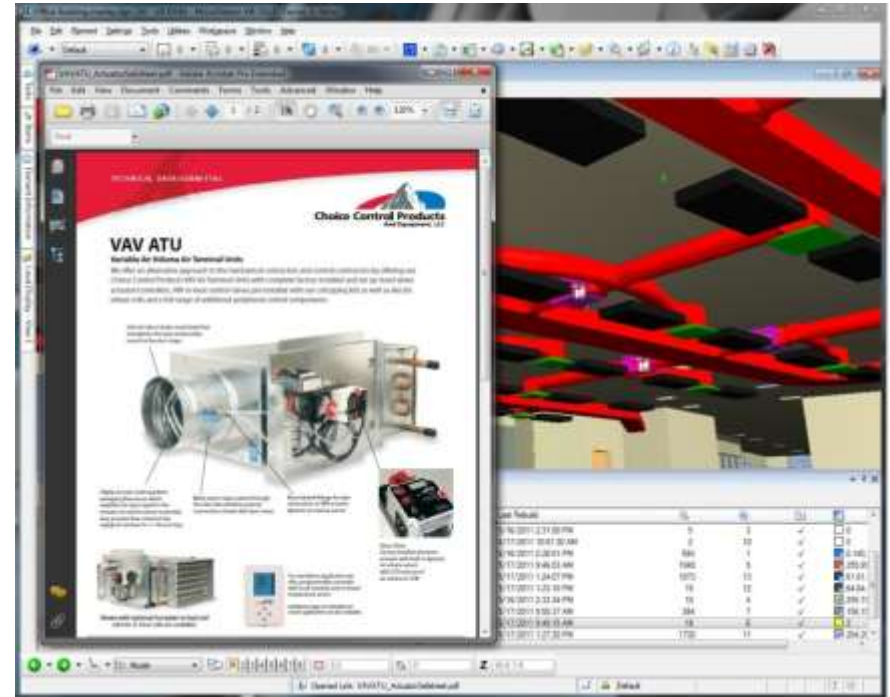
Pain: Similar objects can not easily be viewed together and linked to external documents

Solution:

- Group relevant data together
- Link to additional content

Use Cases:

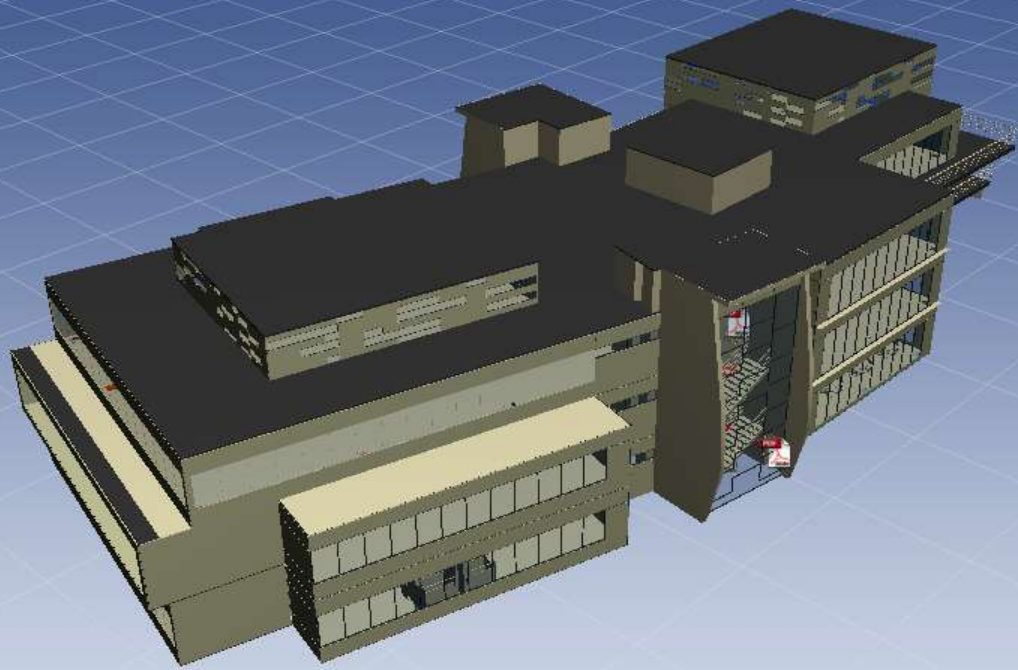
- Group objects by construction status for design review
- Link details, specifications, or other content to sets of items
- Build operational models to provide quick access to related operations/maintenance documents



File Edit Element Settings Tools Utilities Workspace Window Help

Default 0 0 0 0 501

View 1 - StartAVI, Model [Displayset]



Tasks

Items

Element Information

Level Display - View 1

Item Sets

| Active | Name | Description | Selection Expression | Last Rebuild | | | | |
|-------------------------------------|--------------------|--------------|---|-----------------------|------|----|---|--------|
| <input checked="" type="checkbox"/> | Walls | Architecture | Search for items of type "Curtain Panels" where Family is equal to 'System P... | 5/17/2011 1:27:20 PM | 1730 | 11 | ✓ | 204,26 |
| <input checked="" type="checkbox"/> | VAV Units | MEP | Search for items of type "Mechanical Equipment" where Family is equal to '... | 10/6/2011 9:26:39 AM | 18 | 6 | ✓ | 2 |
| <input checked="" type="checkbox"/> | Structural | Structural | Search for any Items where RevitConnectorDocument is equal to 'Bentley St... | 5/17/2011 9:50:37 AM | 384 | 7 | ✓ | 156,15 |
| <input checked="" type="checkbox"/> | Single Flush Doors | Architecture | Search for items of type "Doors" where Family is equal to 'Single-Flush' | 5/16/2011 2:33:34 PM | 10 | 4 | ✓ | 255,19 |
| <input checked="" type="checkbox"/> | Roof | Architecture | Search for items of type "Roofs" where Category is equal to 'Roofs' | 5/17/2011 1:23:10 PM | 15 | 12 | ✓ | 64,64 |
| <input checked="" type="checkbox"/> | Mullion | Architecture | Search for items of type "Curtain Wall Mullions" | 5/17/2011 1:24:07 PM | 1873 | 13 | ✓ | 61,61 |
| <input checked="" type="checkbox"/> | MEP | MEP | Search for any Items where RevitConnectorDocument is equal to 'Bentley M... | 5/17/2011 9:46:03 AM | 1040 | 5 | ✓ | 255,89 |
| <input checked="" type="checkbox"/> | Glazing | Architecture | Search for items of type "Curtain Panels" where Type is equal to 'Glazed' | 5/16/2011 2:28:51 PM | 593 | 1 | ✓ | 0,140. |
| <input checked="" type="checkbox"/> | Elevators | Equipment | Search for any Items where Family is equal to 'Elevator-Electric' | 5/17/2011 10:01:30 AM | 2 | 10 | ✓ | 0 |
| <input checked="" type="checkbox"/> | Double Glass Doors | Architecture | Search for items of type "Doors" where Type is equal to 'Curtain Wall Dbl Gl... | 5/16/2011 2:31:00 PM | 5 | 3 | ✓ | 0 |

Model 2 3 4 5 6 7 8 0:0 0° Z 0:0

Attach Saved View > Select View StartAVI saved view applied Default



Model Population Tools

Pain: Creating realistic models, complete with people, landscaping, traffic, etc. is time consuming and tedious

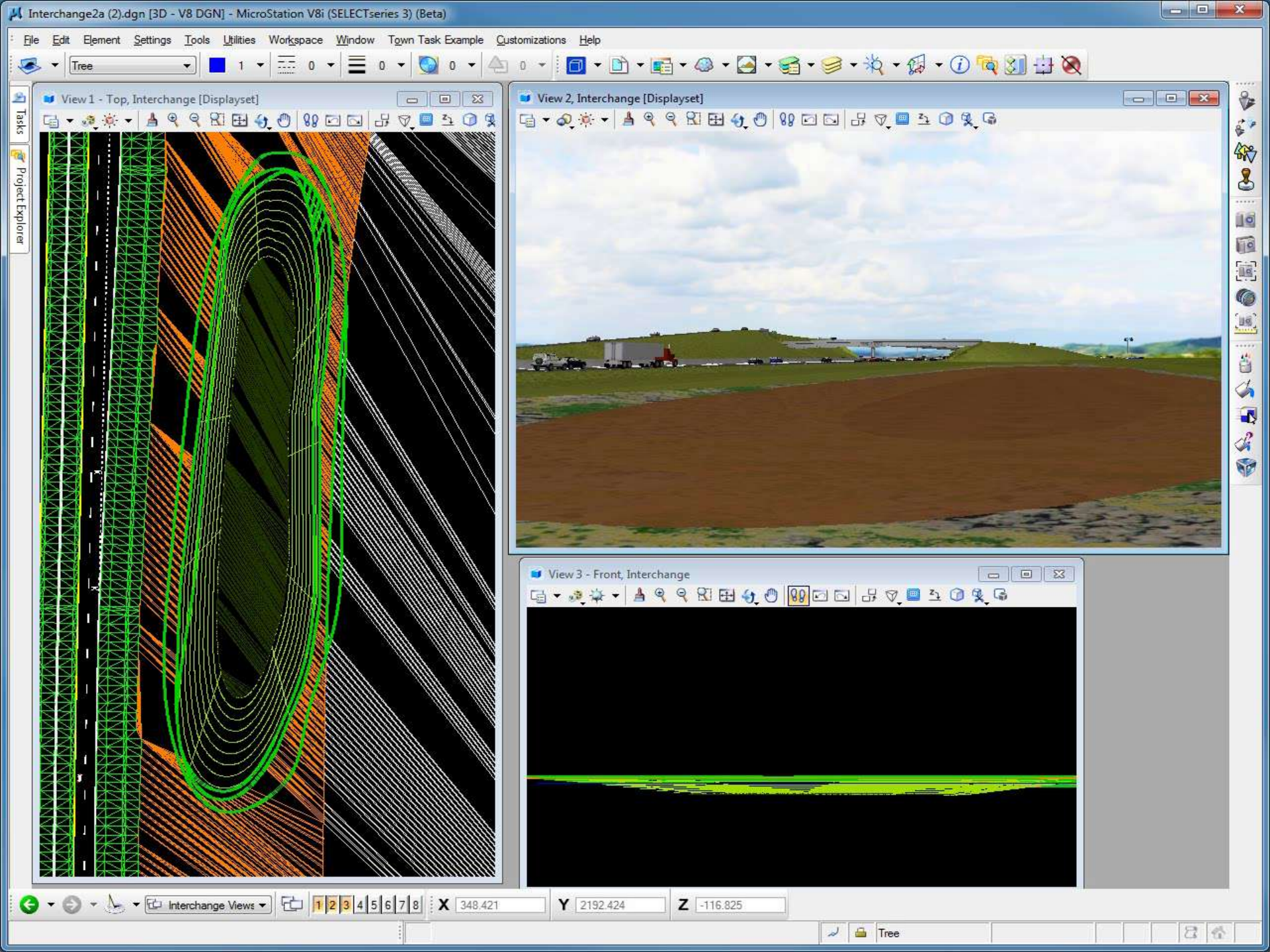
Solution:

- Populate 3D models fast with new placement tools
- Improved realism with randomized placement

Use Cases:

- Tree placement on terrain models
- People placement in models





Content Libraries

Pain: Time consuming to create compelling models

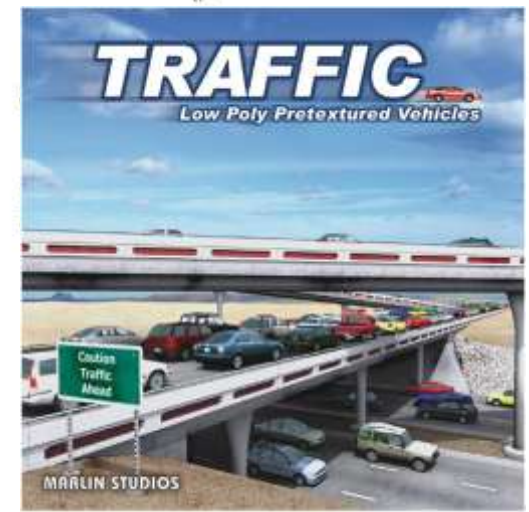
Solution: Built-in libraries of high quality models, materials, environments and lighting

Use Cases:

Marlin library of low polygon vehicles for roads and parking lots

X-Frog library of vegetation for plantings, trees, etc.

Dosch Design library of high detail vehicles



DOSCH DESIGN



Immersive Interaction with Point Clouds

- Understand and interact with all available design information and leverage it in real-time

Immersive Interaction

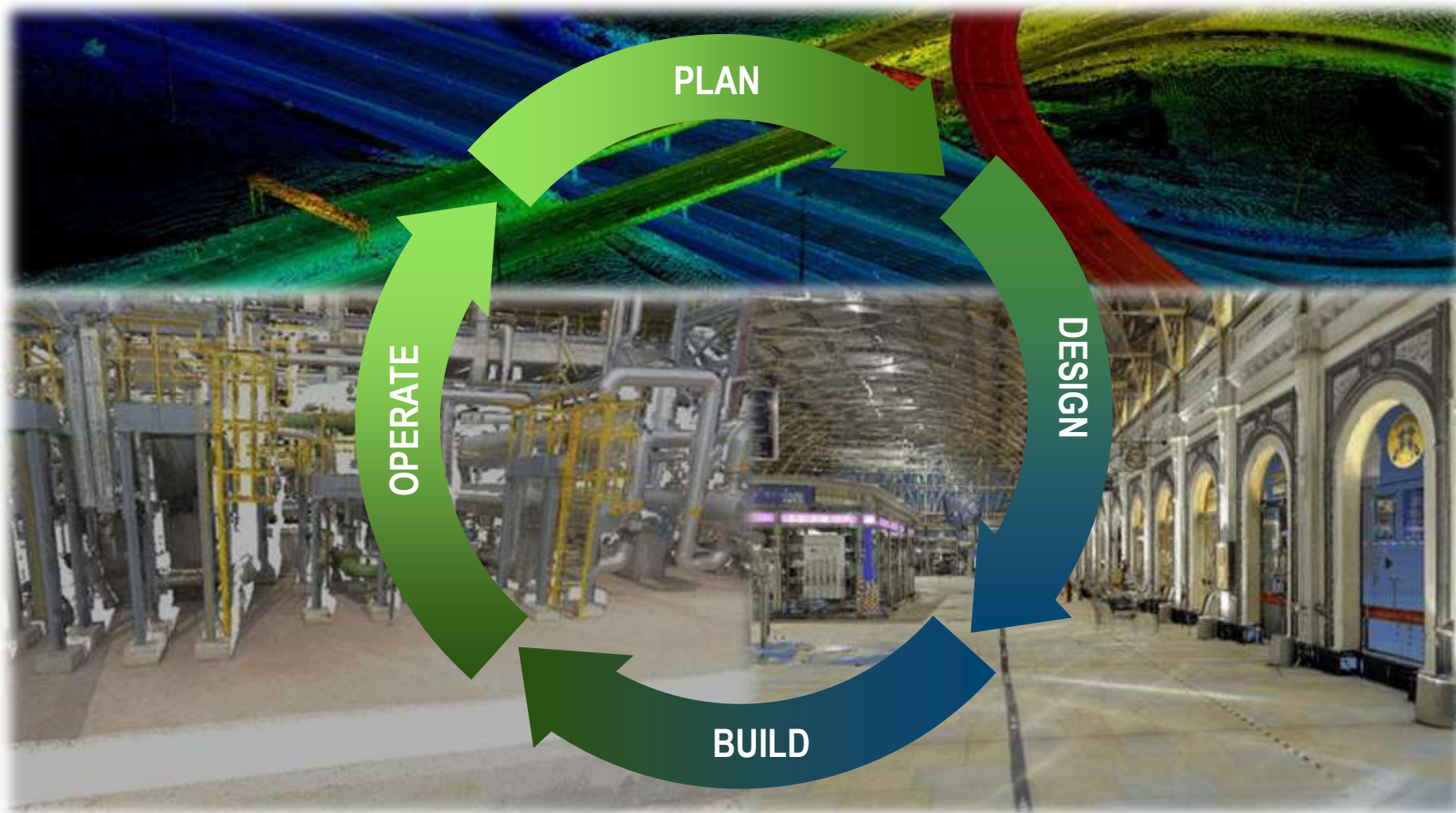


Completely Fulfilling Requirements

Providing broader awareness

Ensuring design, construction and operational decisions

Point Clouds for Infrastructure

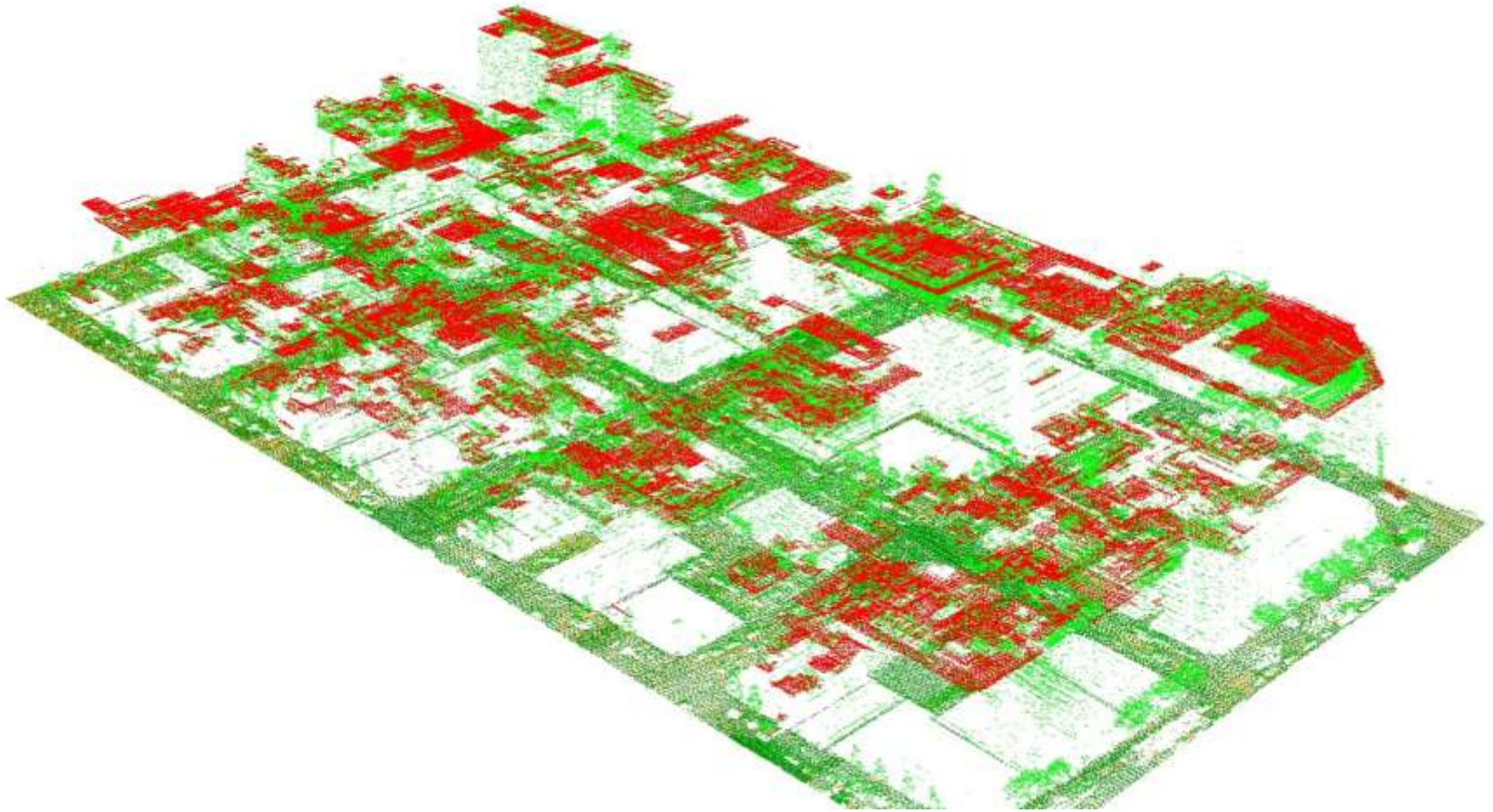


Point Clouds for Infrastructure

- Cheaper & safer surveying technique
 - Field operations are shorten reducing field cost and risks
- 3D Visualization and retrofitting;
 - Reduce the need of “geometric” based model
 - Use the Point Cloud as the 3D background model defining the context
- Direct access to accurate as-built information
 - Reduce the need for field operations
 - Better planning & design



3D Mapping with Aerial LIDAR



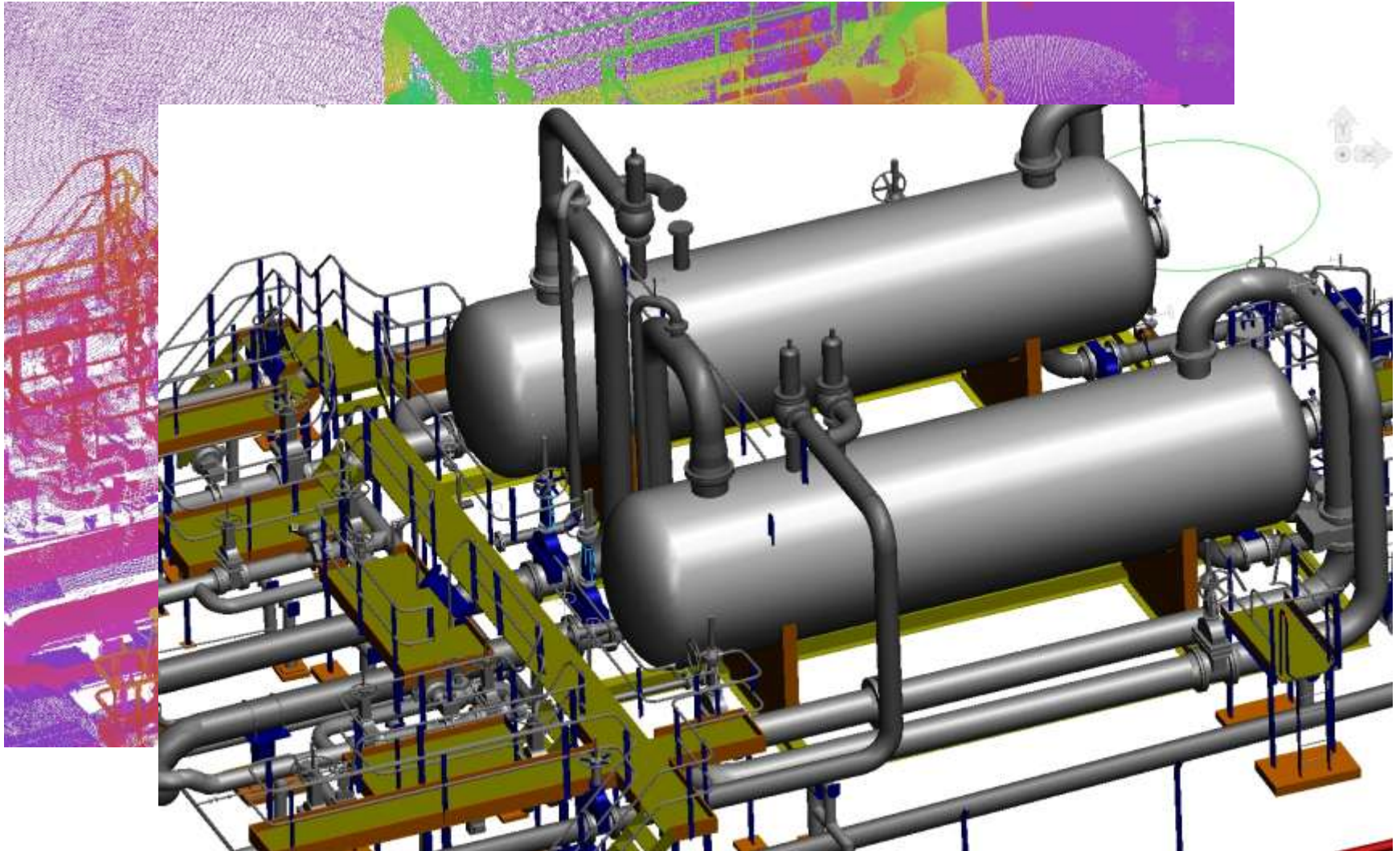
Nagoya Japan - data courtesy of Nakanihon Air Service – Model created with TerraScan and TerraPhoto

3D Mapping with Aerial LIDAR

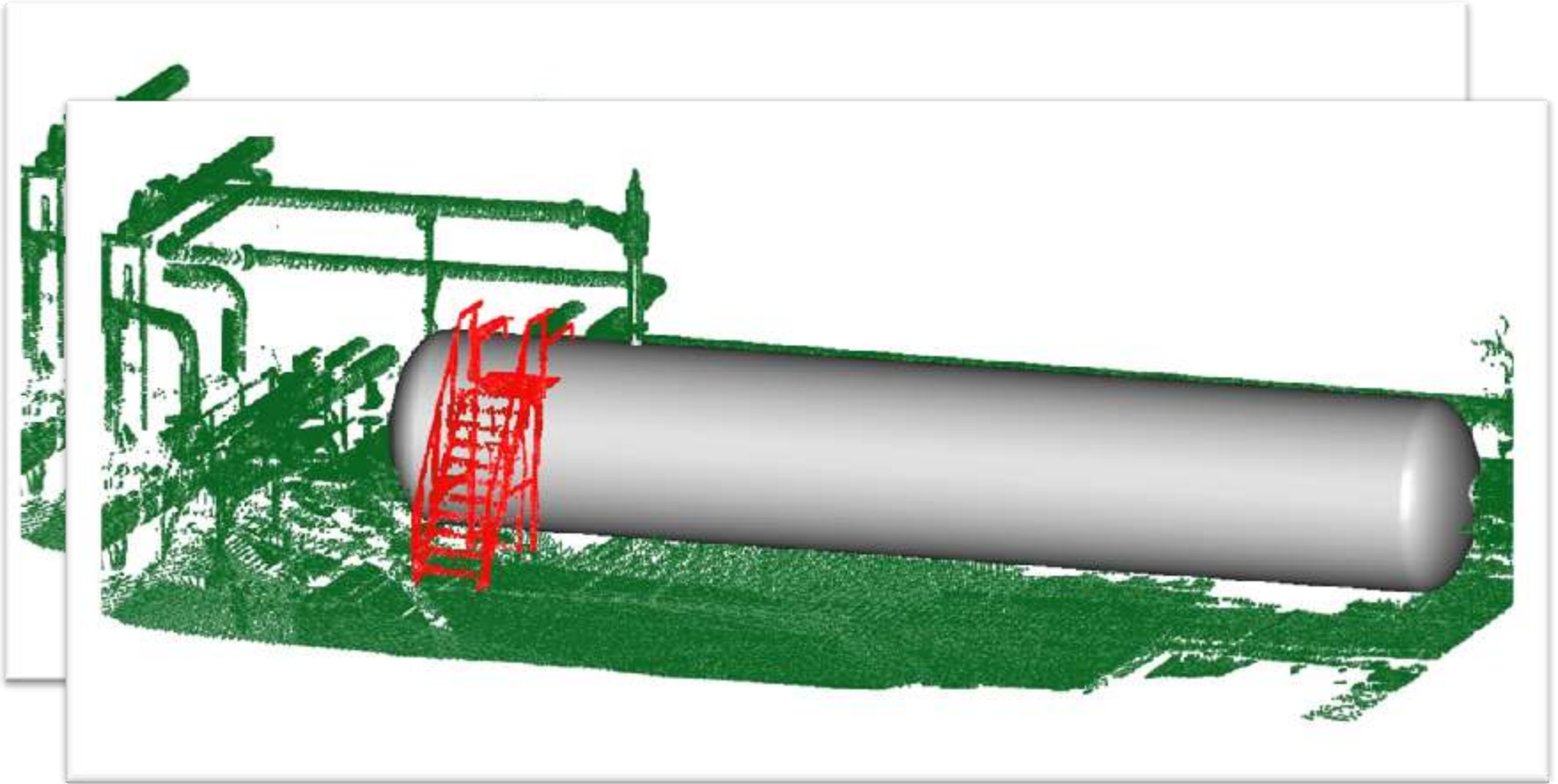


Nagoya Japan - data courtesy of Nakanihon Air Service – Model created with TerraScan and TerraPhoto

3D Modeling from Point Cloud



Retrofitting – Simulate equipment replacement



Bentley + Pointools



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

Bentley Makes Point Clouds Valuable Across Full Infrastructure Lifecycle Through Acquisition of Pointools Ltd.

New Fundamental Data Type to Be Leveraged by ProjectWise and AssetWise

AMSTERDAM, Netherlands – *Be Inspired: Thought Leadership in Infrastructure* and *SPAR Europe* – Nov. 8, 2011 – Bentley Systems, Incorporated, the leading company dedicated to providing comprehensive software solutions for *sustaining infrastructure*, today announced that it has acquired Pointools Ltd., the leading hardware-neutral provider of point cloud software technology, in order to integrate point cloud processing in innovative ways throughout its product portfolio. Point cloud inclusion supports Bentley's commitment to advance *information mobility with integrity* across project and asset workflows. Point cloud scanning devices are fast becoming commonplace, so images are now cost-effective to capture, but have served only for temporary and task-specific purposes, because the volume of the data overwhelms both storage and query accessibility. Now that Bentley is uniquely addressing these challenges, point clouds, as a

Bentley Point Cloud Support

Bentley Pointools V8i

Animation / Movie

Animation / Movie

Edit colors

Segment/Classify

Convert

Visualize

Clash Detection

Differencing

Bentley Descartes

Create scalable terrain model from point clouds

Drape line/point on point clouds

Cylinder geometry extraction

Smart Snap on point clouds

Advanced point-cloud export

Point-cloud classification editing

Plane geometry extraction

Flashlight display mode

Bentley Pointools View

Convert

Visualize

Measure

MicroStation, Navigator, Civil, Geospatial, Plant, Building Products

View, manipulate, control point clouds

Publish to Navigator for iPad

Fast, reliable native data type

Third party APIs

PODcreator

Convert

Batch Process

ProjectWise

Centrally manage point clouds

Stream point clouds to multiple clients

Bentley Geo Web Publisher

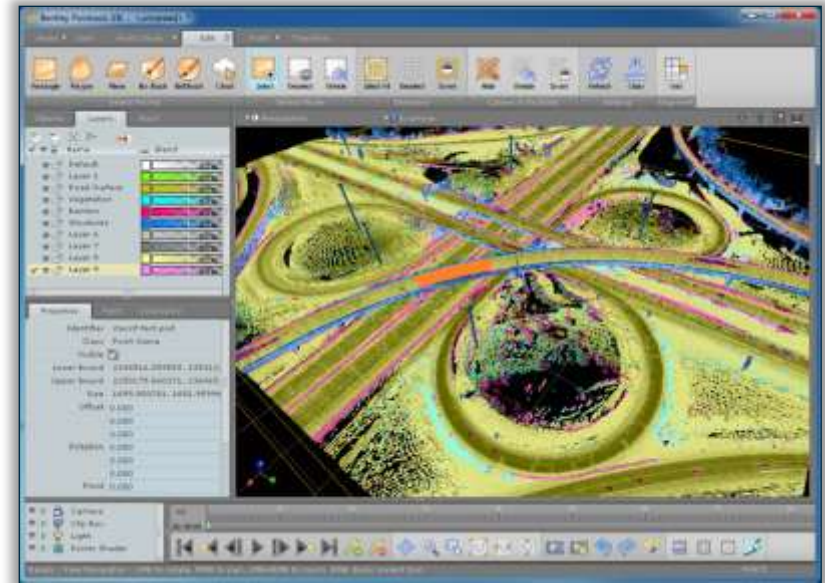
View 3D scenes on the web including point clouds

iWare Point Cloud Products

- **iWare** are *free* applications downloadable from Bentley.com
- Available later this year:
 - **Bentley Pointools View**
 - Powerful Point Cloud Viewer
 - No export capabilities
 - No animation, editing etc
 - Consumes projects / data produced with Bentley Pointools V8i
 - **Bentley PODcreator**
 - Batch conversion of laser scan formats to POD
 - Gets a UI update
 - Adds e57, Z+F, and LAZ formats

Bentley Pointools V8i

- High Performance
- Fast Layer Based Editing
- Powerful Movie Production
- Enhanced Visualization
- Clash Detection



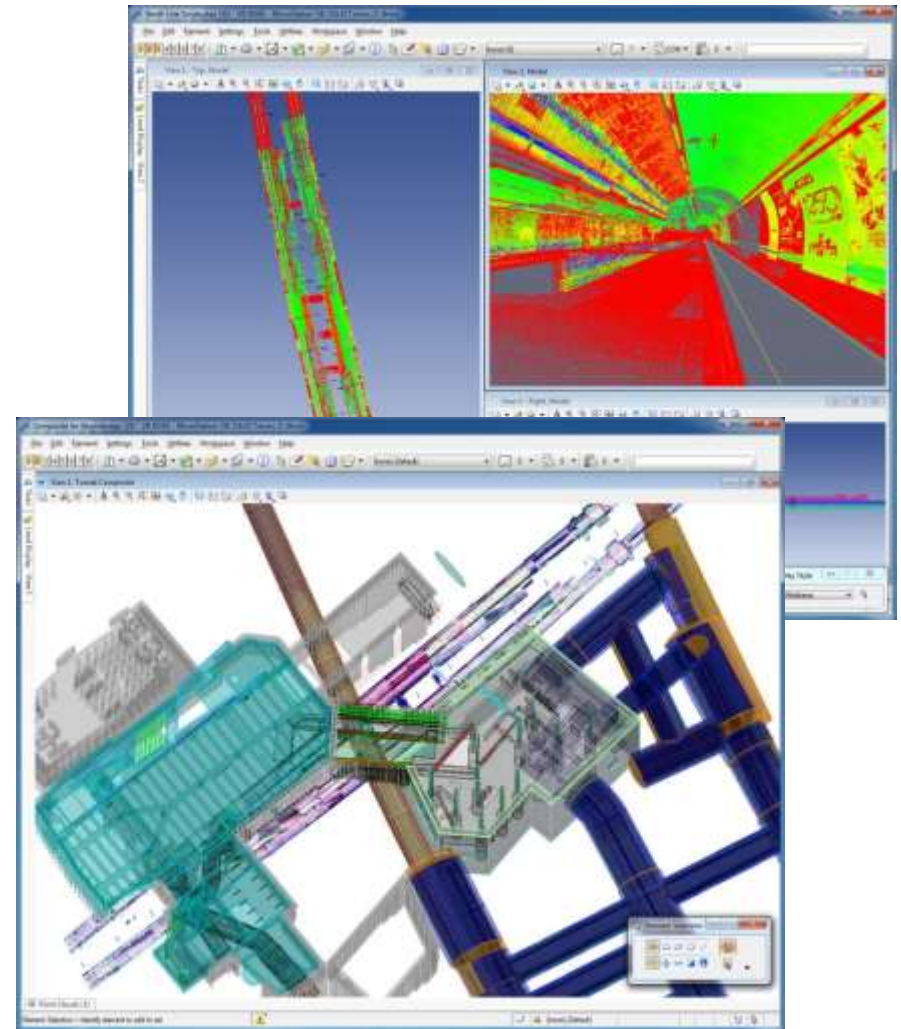
Point Clouds in V8i Desktop Applications

Native DGN Element

- Standard Viewing tools
- Similar to a reference file attachment
- Snap and Locate
- Measure, move, scale, etc.
- Level on/off

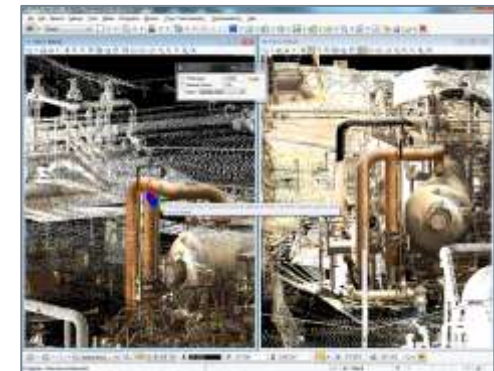
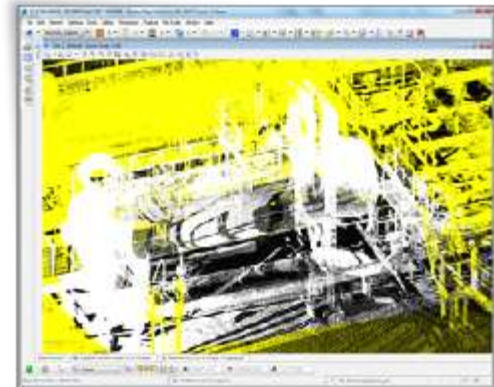
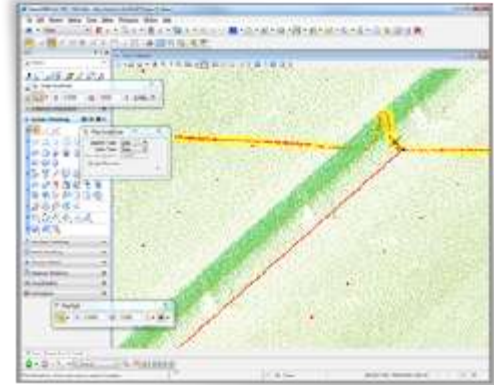
Point Cloud Presentation

- RGB
- Classification
- Elevation
- Intensity



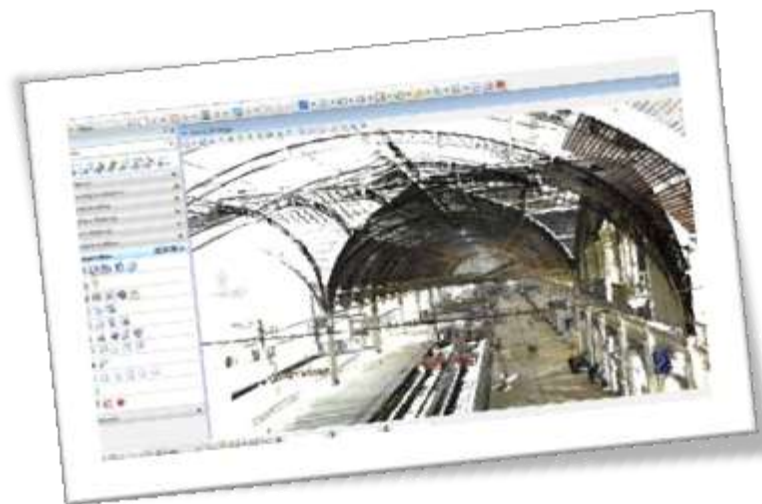
Point Clouds in Descartes V8i

- Point Cloud Processing
 - Geometry Extraction
 - Classification Editing
 - Line Draping
- Classification Editing
 - Fix classification errors
 - Eliminate Point Cloud “noise”
 - Enable hybrid and retrofit workflows
- Geometry Extraction
 - Planes and Cylinders



Point Cloud Data Management in ProjectWise

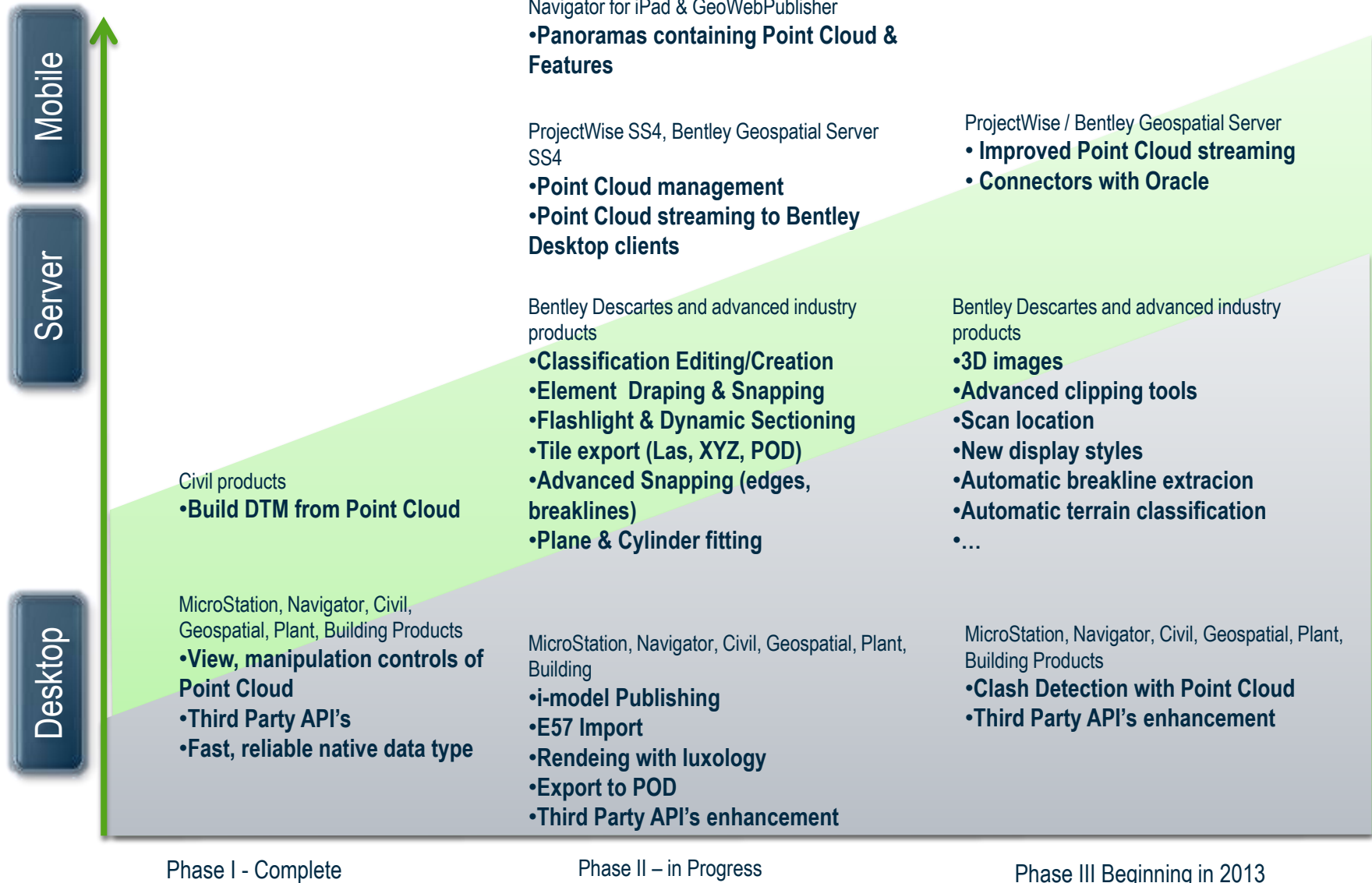
- Centrally manage point cloud data
- Enable distributed team access
- Stream point cloud data to applications
- High performance access
- Available in ProjectWise V8*i* (SELECTseries 4)





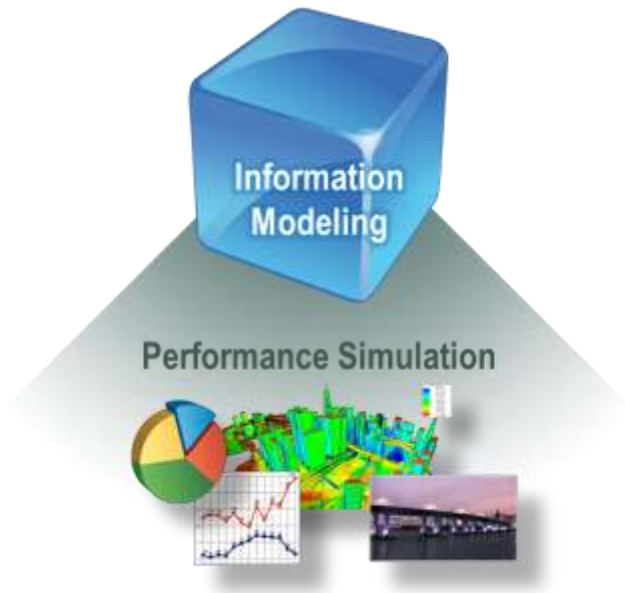
Point Clouds on the iPad

Information Mobility with Point Clouds



Performance Simulation

Predict real-world performance



Quickly

With Precision

To explore options

Through iterative refinement

Within one or more areas of focus

Across the lifecycle

Real World Performance

- 75% of the decisions that drive the performance of a design are made in the conceptual phase
- Material Production
- Transportation Logistics: “think locally”
- Material Disposal
- Emissions
- Construction Costs
- Operations Costs



Performance Simulation

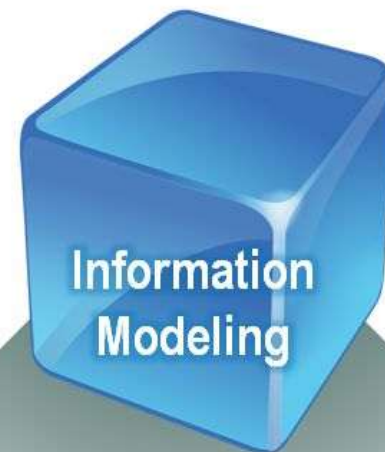
Conceptual to detailed analysis of



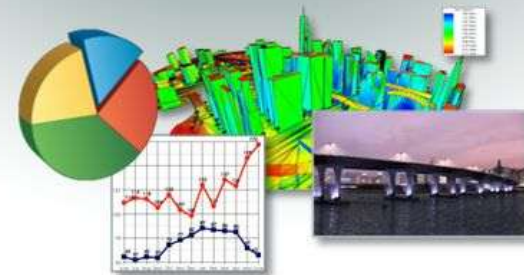
Performance Simulation

Predict real-world performance quickly and precisely

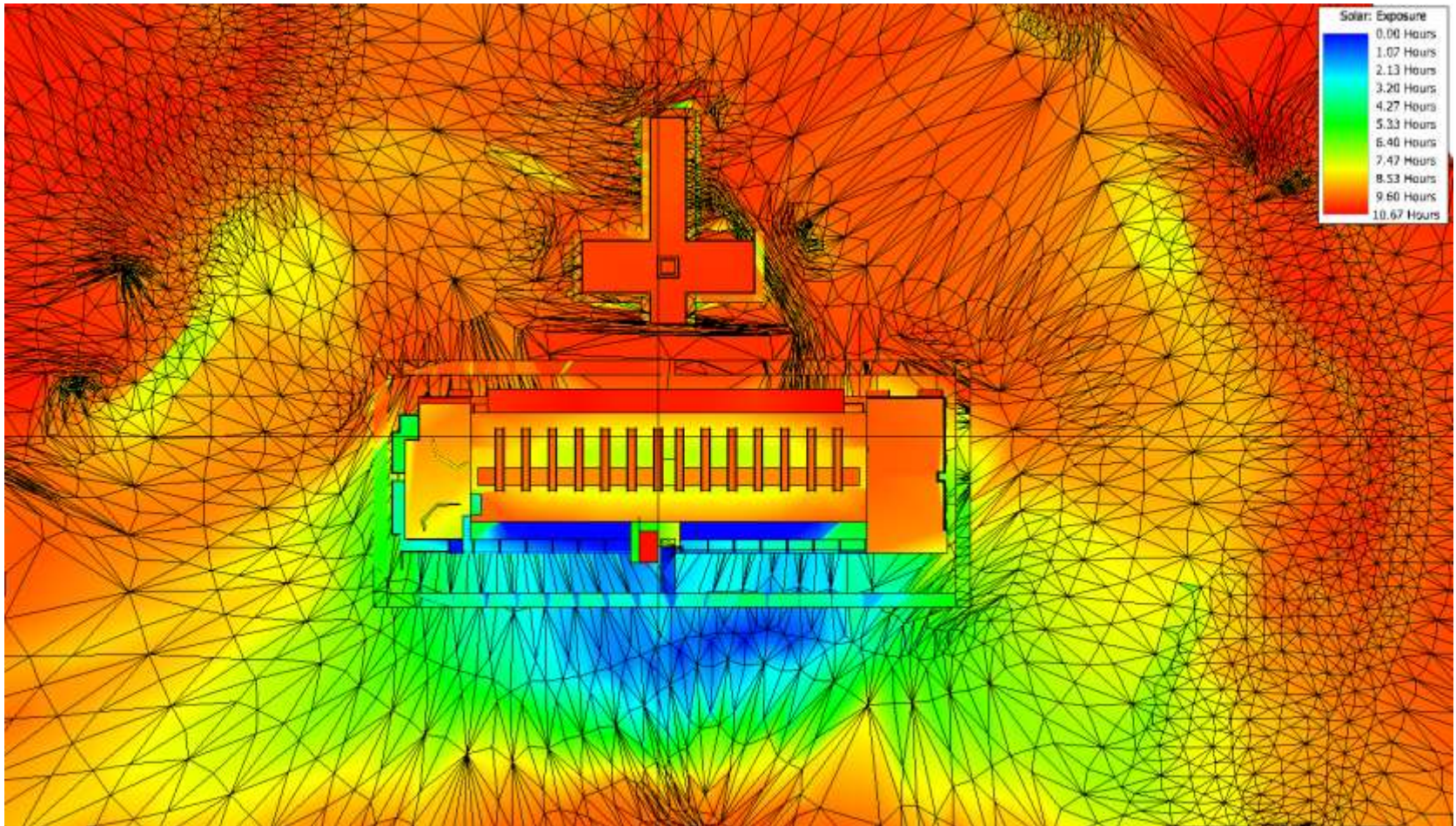
- LandXML, IFC, JT Interoperability
- Terrain Model Visualization
- GenerativeComponents
- Model Population
- Item Sets
- Document Linking
- ODBC Reporting
- Solar Study
- Solar Shadows
- Thematic Display
- Traffic Animation
- Schedule Simulation
- Clash Resolution



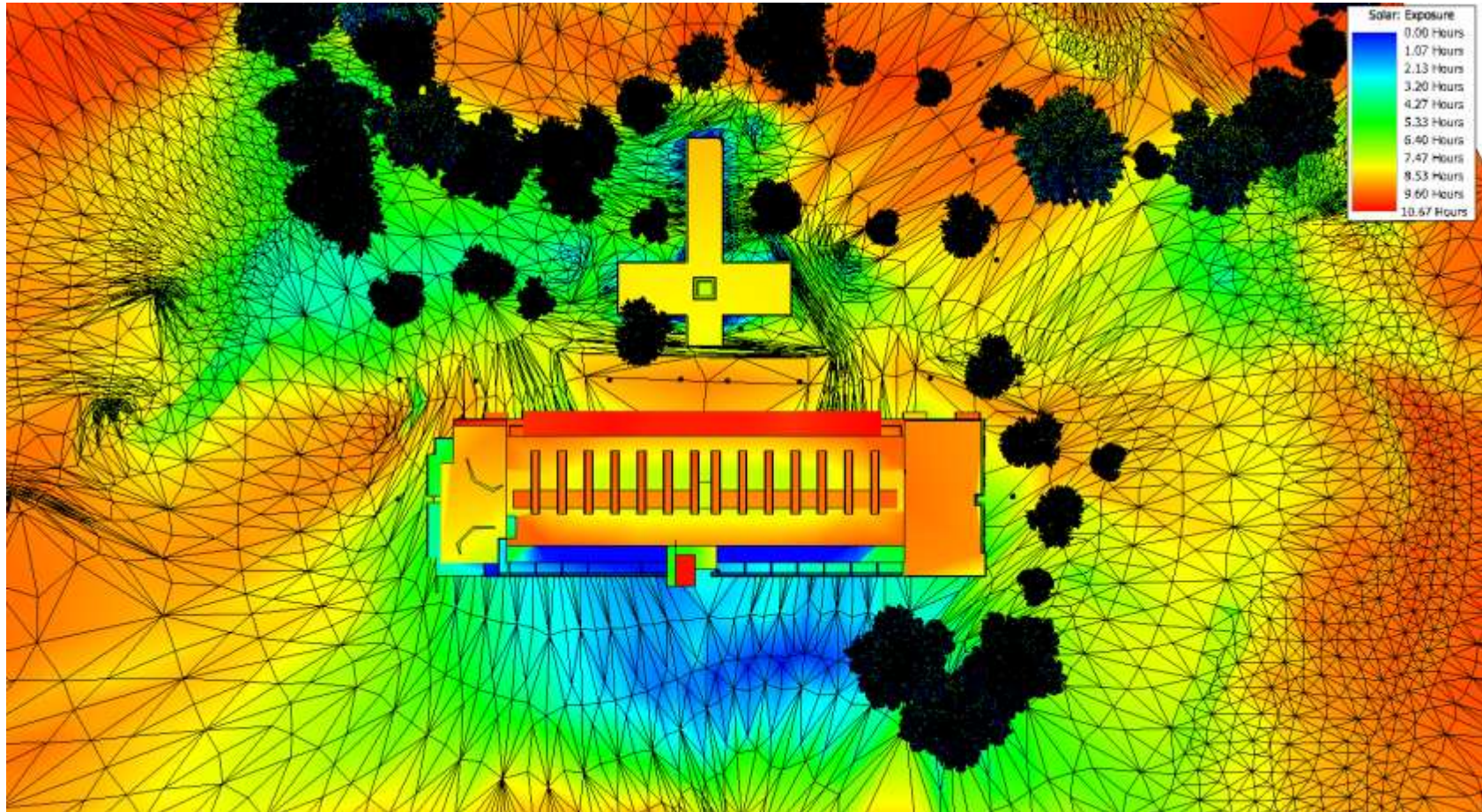
Performance Simulation



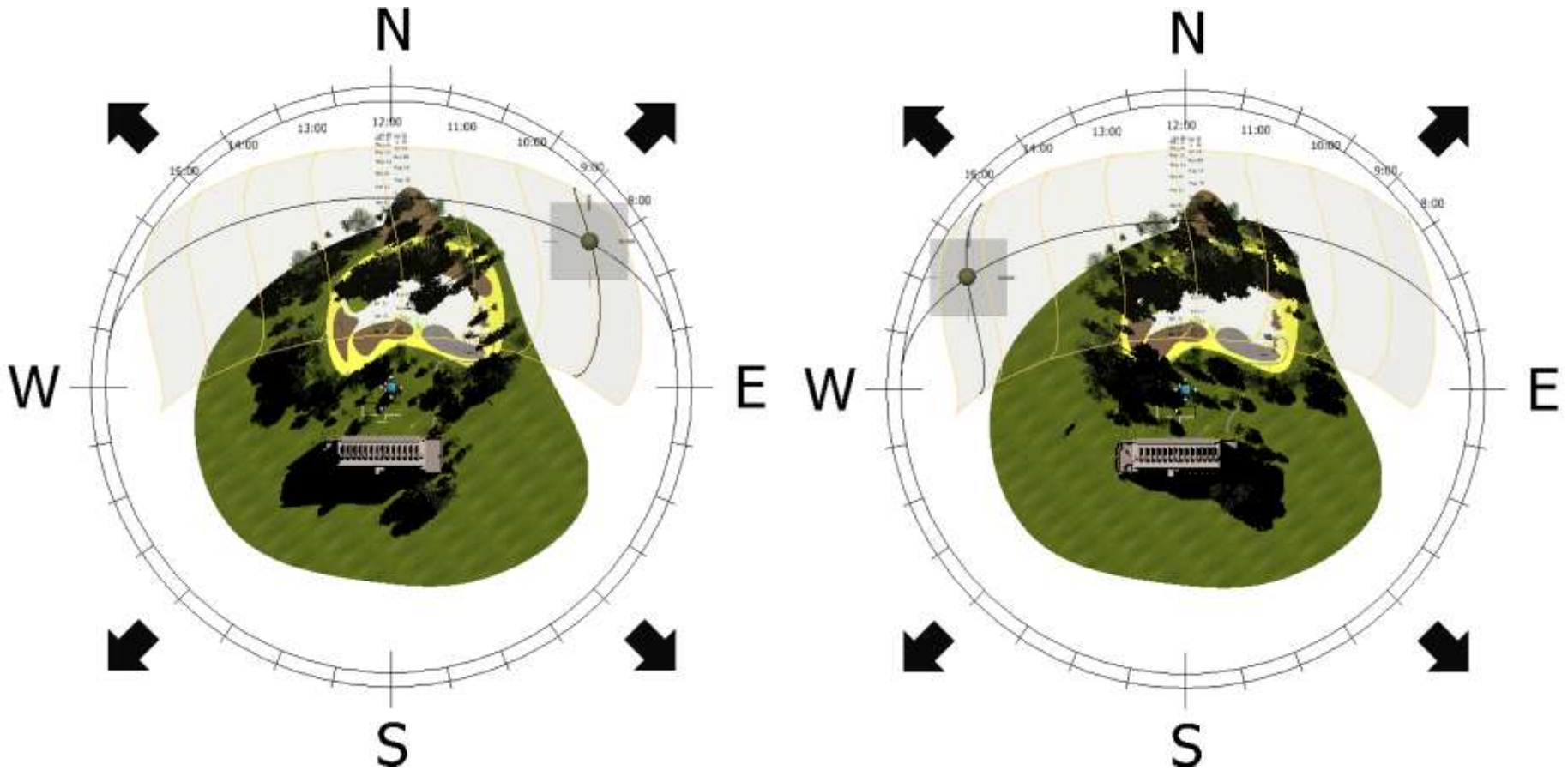
Site Feasibility



Site Feasibility

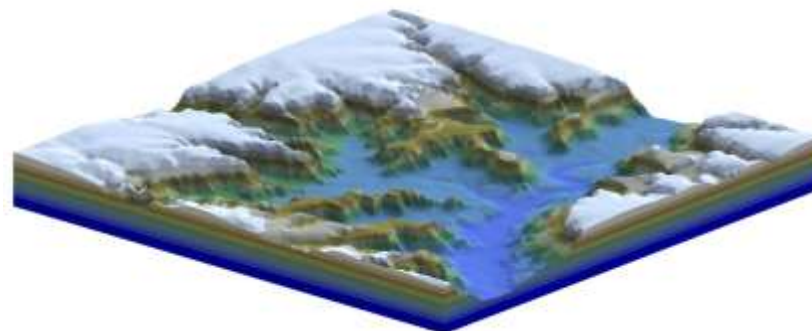
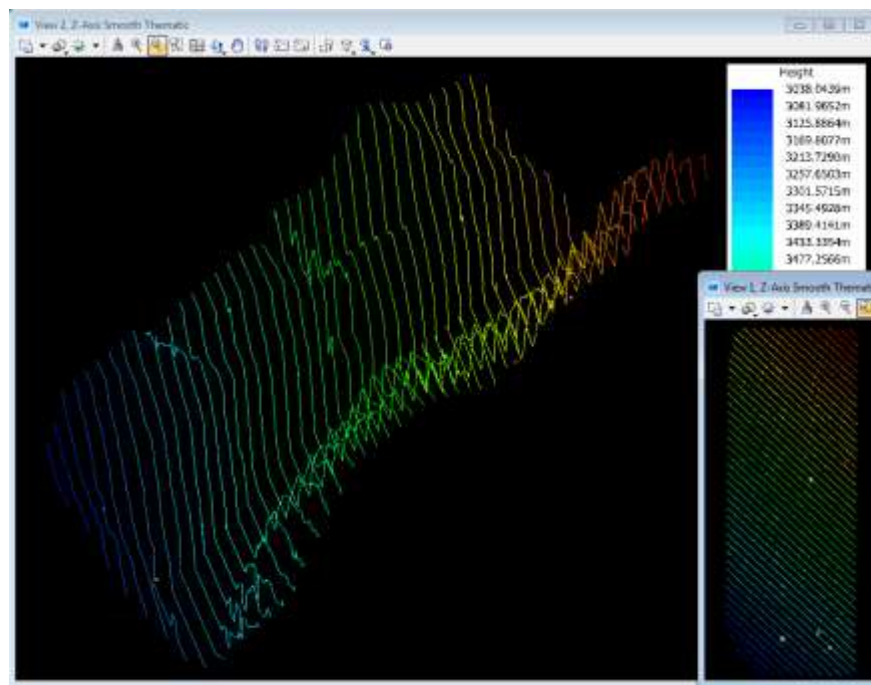


Site Feasibility

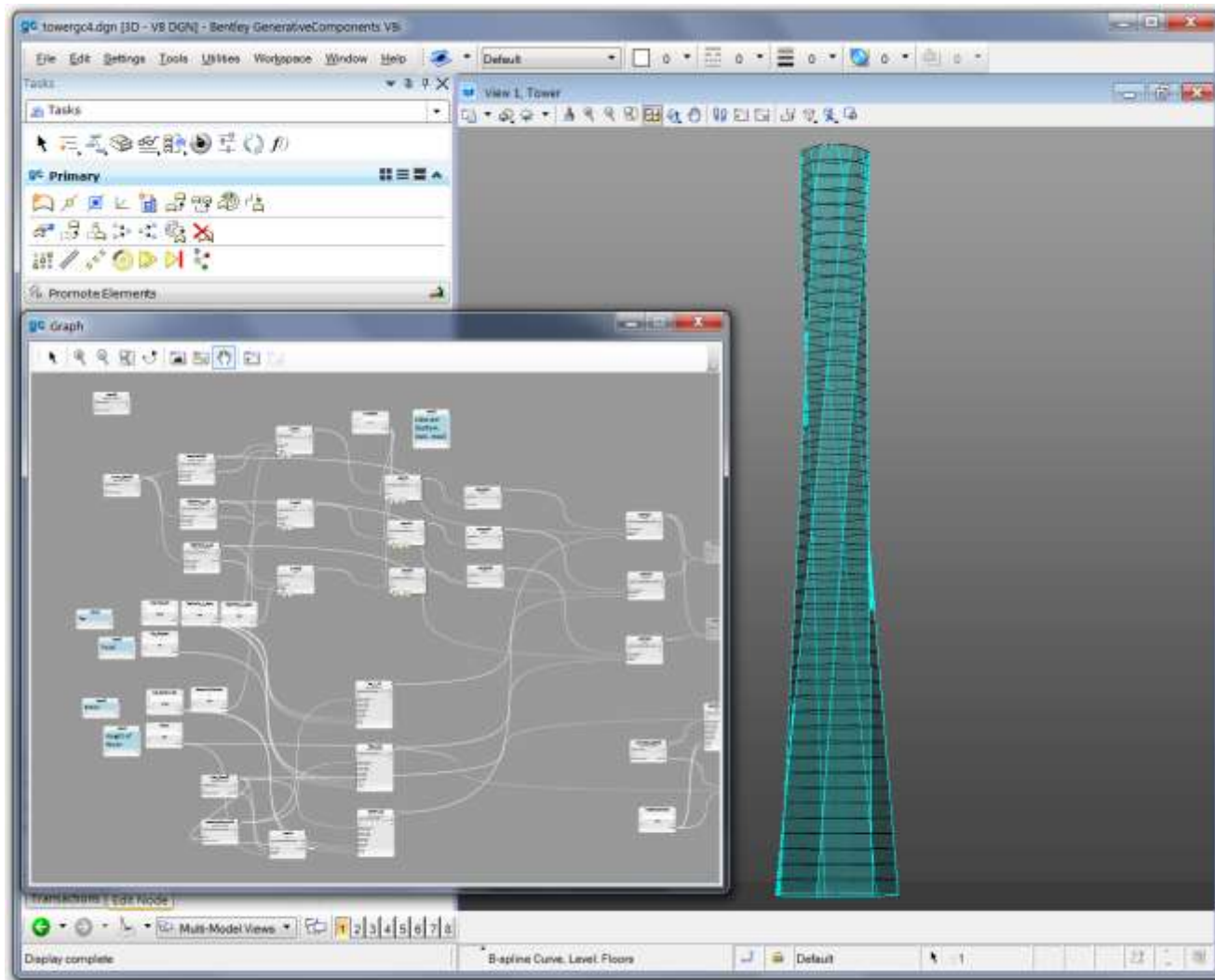


Thematic Visualization

- Thematic Display Styles
 - Real-time display of Height, Slope, Aspect Angle, and Hill shade
 - Review thematic characteristics of models in real time
 - Produce maps and presentations based on thematic characteristics
 - Customize for your project



Program Management



Tasks

Tasks

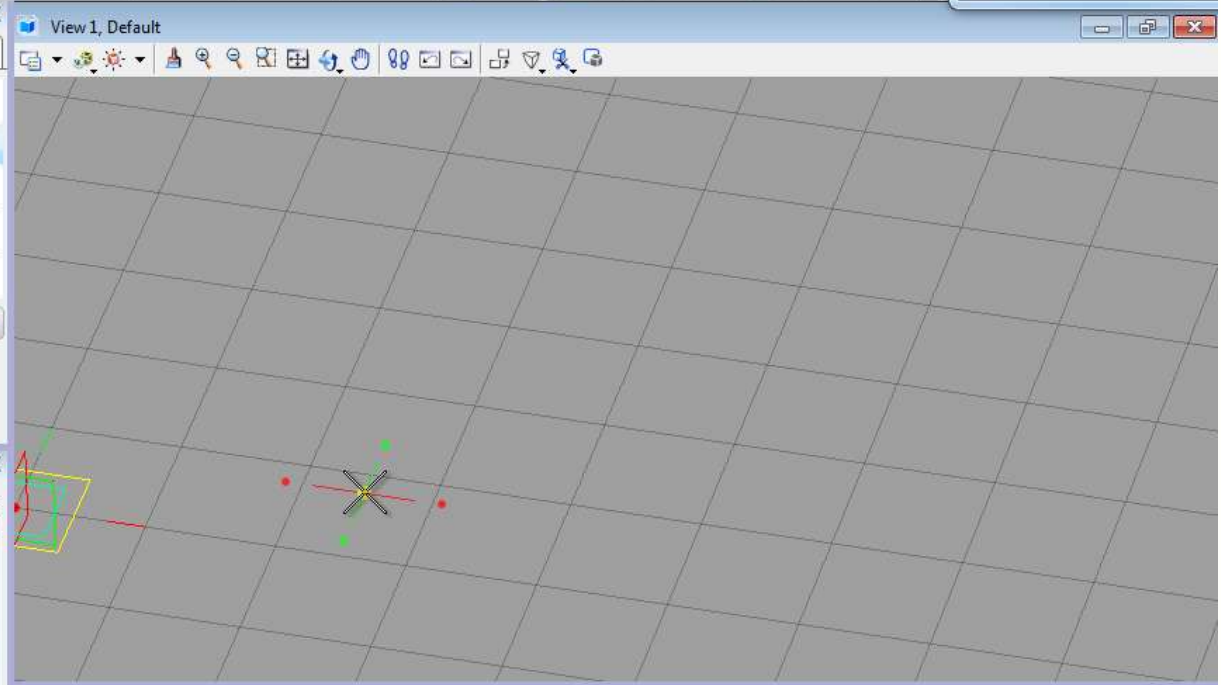
GC Primary

Q

W

E

Promote Elements



New Node

Node types, techniques Show general properties

Node Type

- Technique
- ByAngleCenterStartPlanePoint
- ByCenterRadiusSweepAngle
- ByCenterStartSweepPoint
- ByFunction
- ByImportedData
- ByLengthStartEndPoint
- ByPointsOnCurve
- ByTangentCurveStartEndPoint
- ByTangentDirectionEndPoint
- CircularOffset
- ComplementArc
- ConvertCurveToArcSegments
- CopyTransformGeometricContents
- ExtractRegionUsingParameterSpan
- ExtractRegionUsingStartEndPoint
- FilletTangentToCurves
- FromDEllipse3d
- FromElementsInAttachment
- FromElementsInCell
- MirrorCopyGeometricContentsAboutPlane
- PartialDeleteUsingParameterSpan
- PartialDeleteUsingStartEndPoint
- ReverseArc
- SelectEntitiesWithinRange

Type:

Technique: Example

Name of new node:

Assign active symbology

Edit Last OK

Graph

Generative Design

VISUALIZATIONS

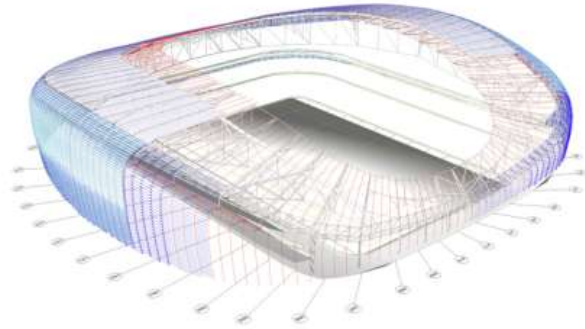


Generative design lets architects and engineers express their innovation resulting in design excellence.



Stone Towers
Zaha Hadid Architects
Cairo, Egypt

Generative Design



- Parametric Modeling



Aviva Stadium
Populus
Dublin, Ireland

Generative Design



The Lagoons
Thompson, Ventulett, Stainback & Associates
Dubai, UAE

- Design creativity



Ukrainian Health Protection Centre for
Women and Children
BDP
Kiev, Ukraine

Progressive Refinement and Fast Render Previews

Pain: Waiting for rendering wastes time

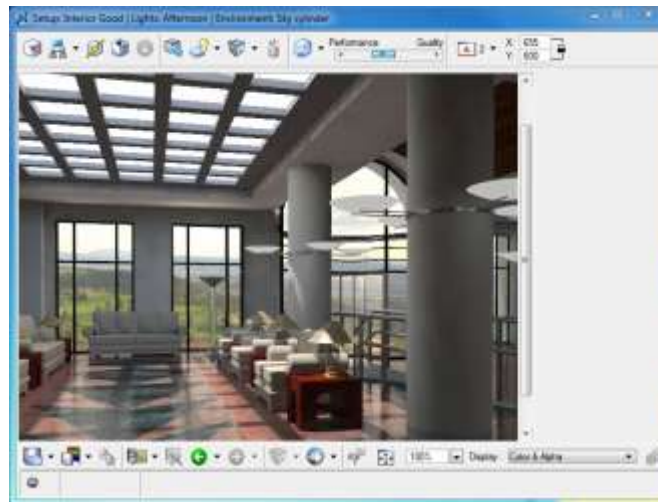
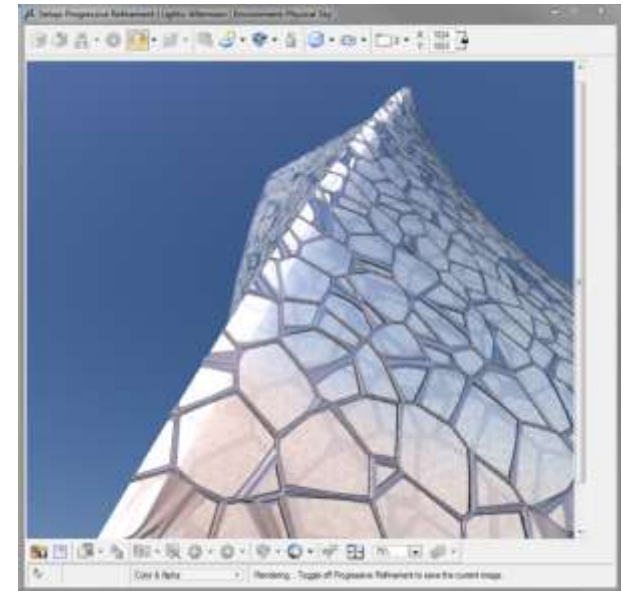
Solution:

- Previews produced in near-real time
- Results improve as render progresses

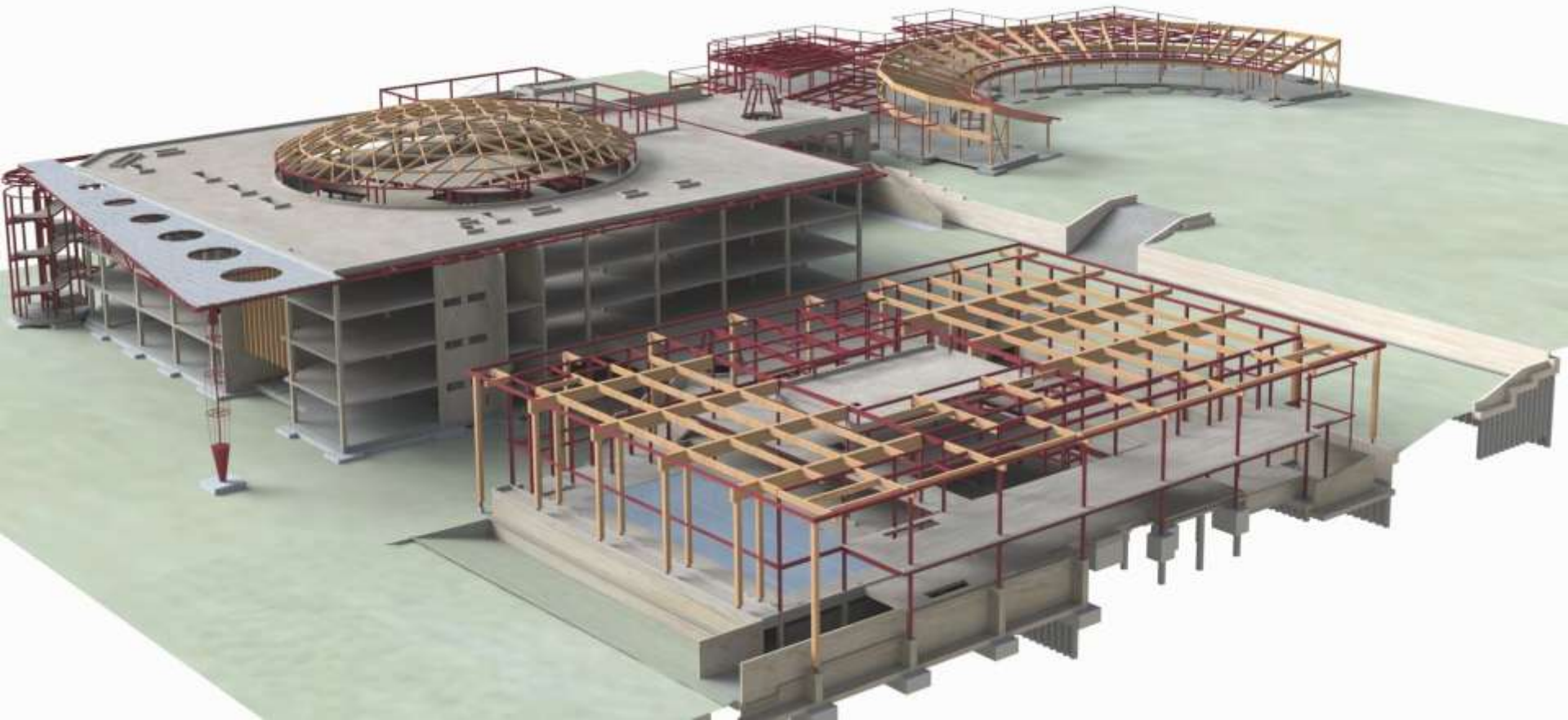
Use Cases:

Quickly Explore multiple:

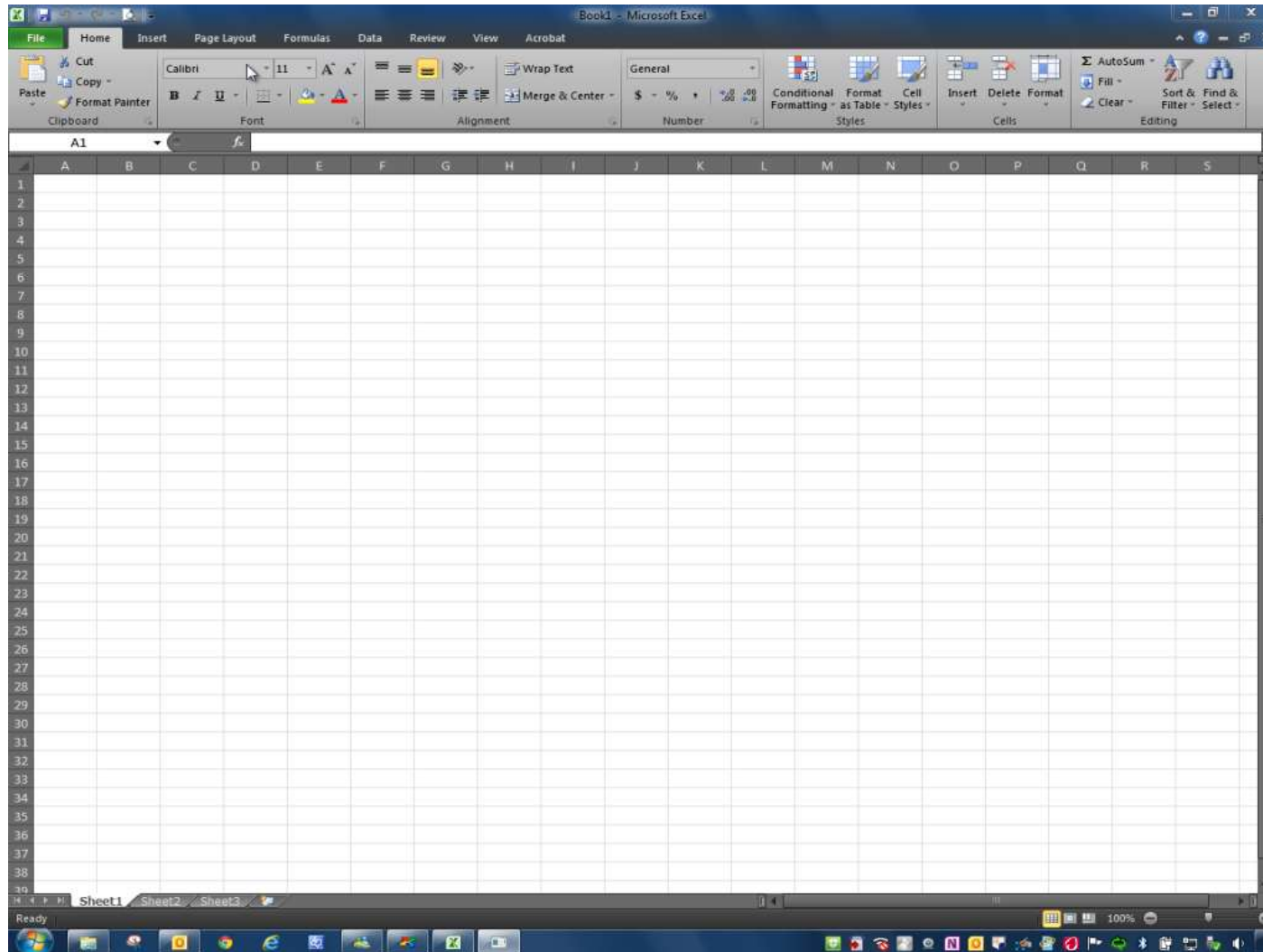
- Materials
- Lighting options
- Camera positions



Material Performance



Material Performance



Environmental Impact



Traffic and Safety





*Louis van Amerongen
Designer, Witteveen+Bos*

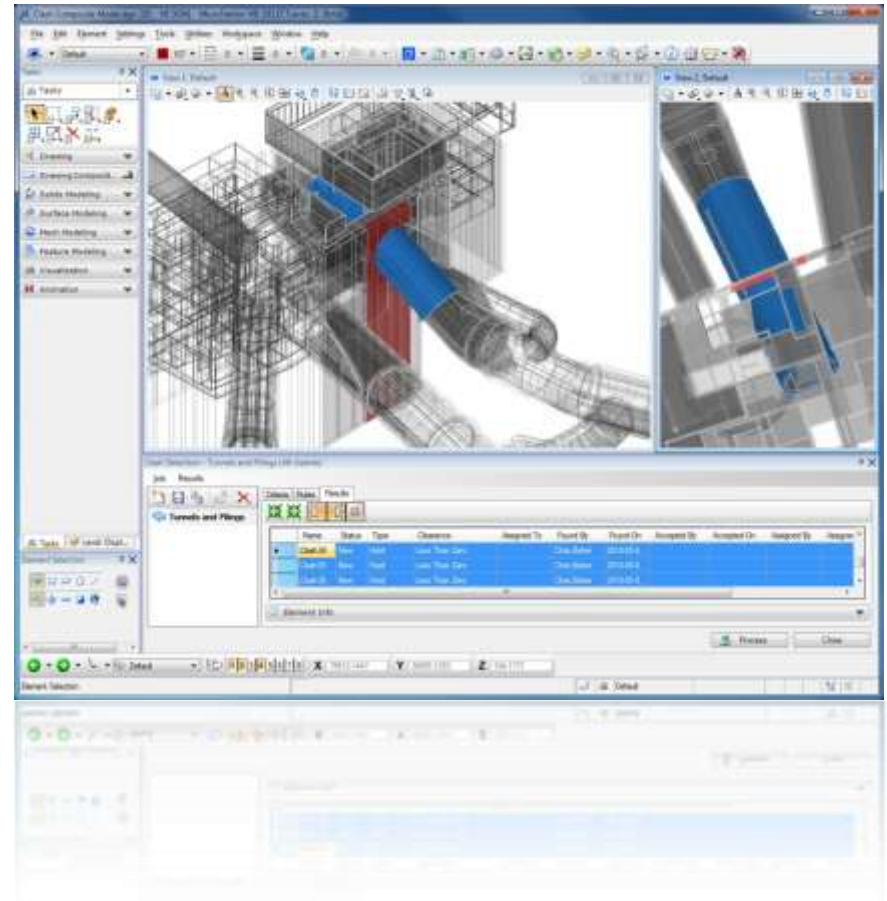


*Tim Kohn, Director, Technology Solutions
AECOM office of the CTO*



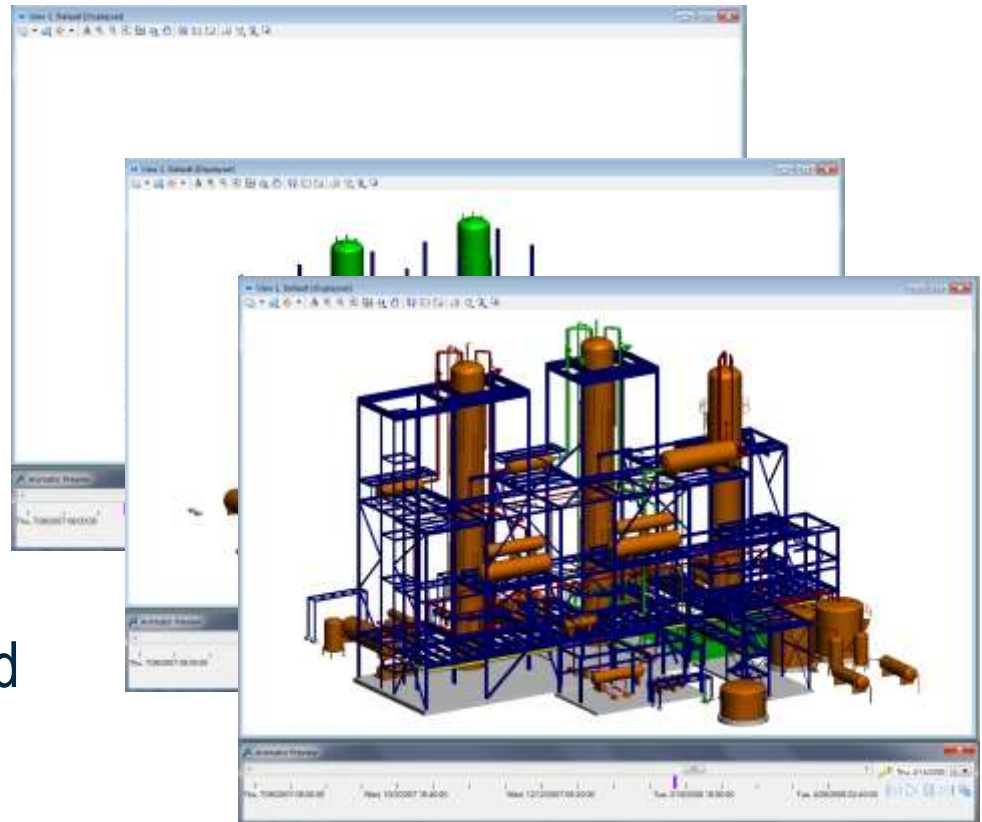
Constructability

- Clash Resolution
 - Validate design at the time of creation
 - Make changes in real-time during design and layout to avoid costly mistakes downstream
 - ProjectWise Clash Resolution Visa Required



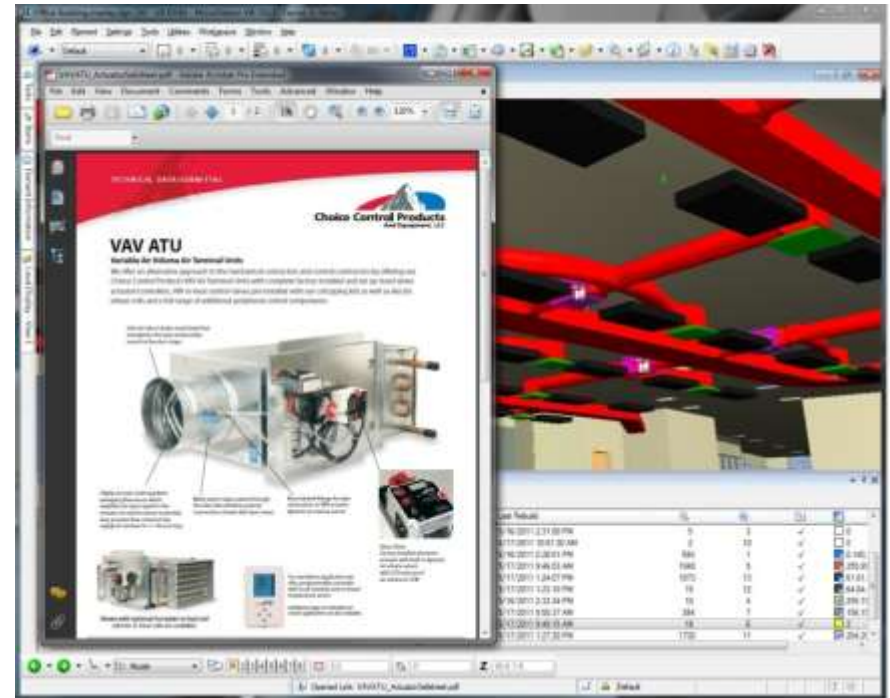
Constructability

- Schedule Simulation
 - Visualize project scheduling
 - Round trip data from scheduling software
 - Build schedules directly in MicroStation
 - ProjectWise Schedule Simulation Visa Required

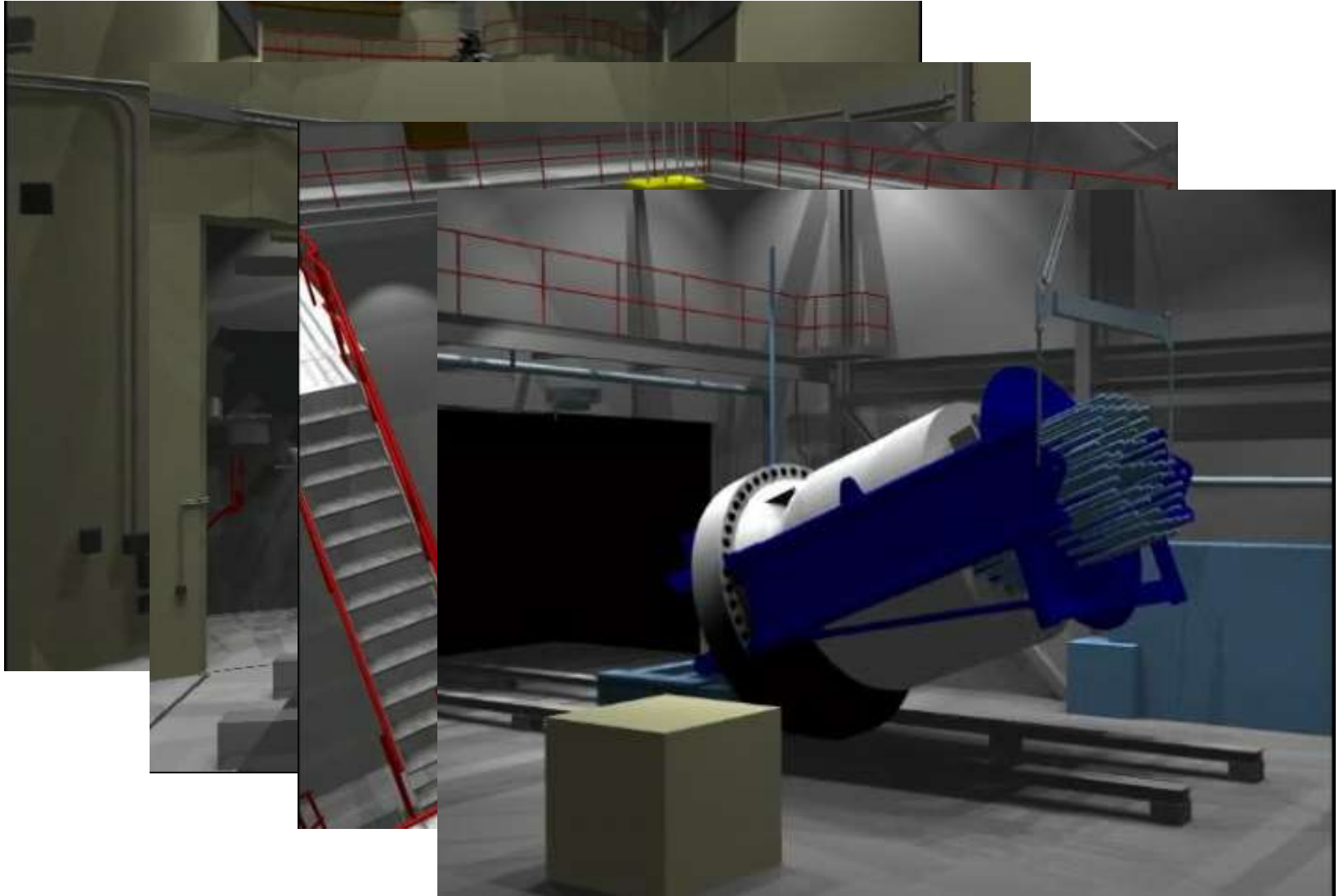


Facility Performance

- Group objects by construction status for design review
- Link details, specifications, or other content to sets of items
- Build operational models to provide quick access to related operations/maintenance documents

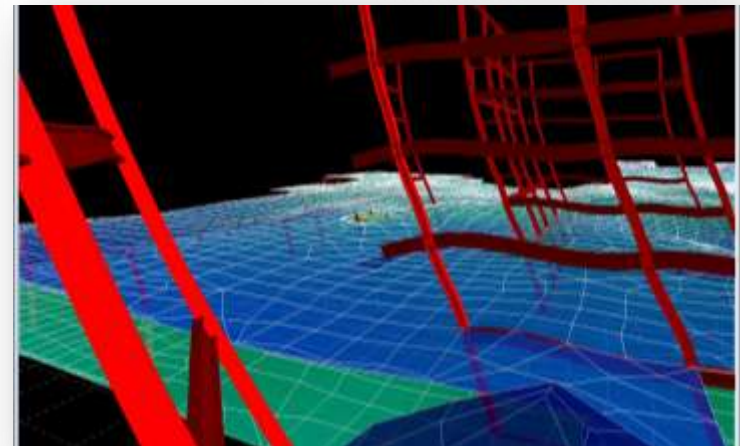
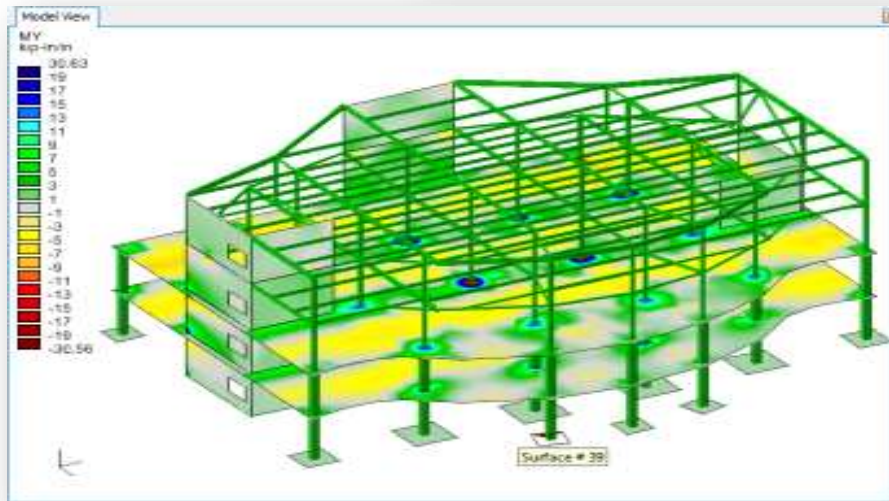
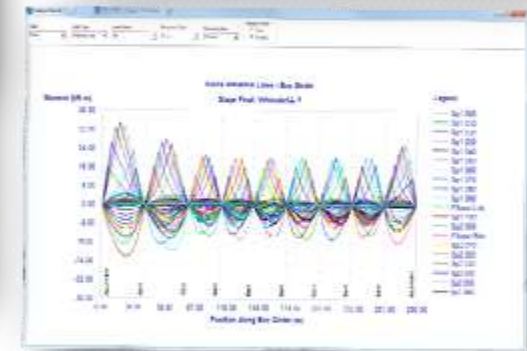
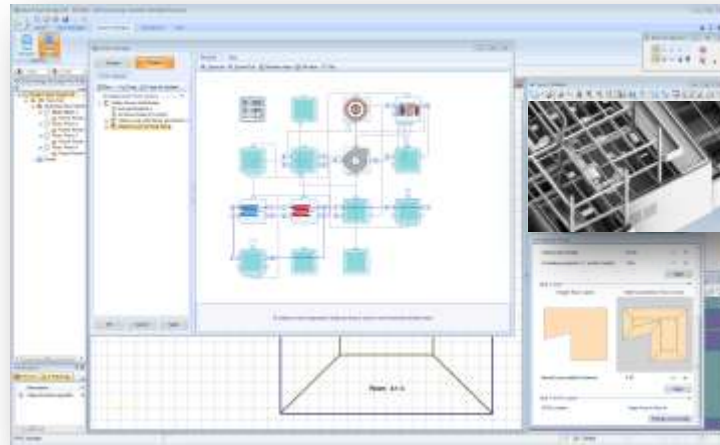


Facility Retrofit



Bentley's Performance Portfolio

- Building
- Bridge
- Structural
- More..

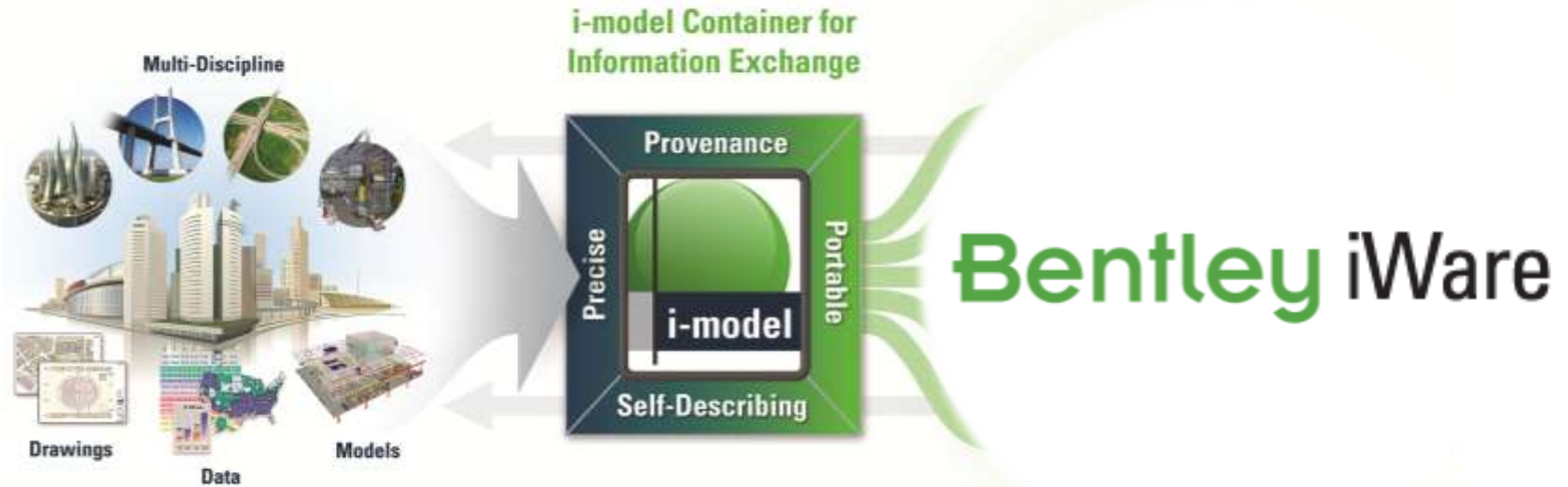


Information Mobility

- **The long awaited payoff for interoperability:** ensuring the right information, in the appropriate format and level of precision, can be accessed by the right people at the right time.
- *Bentley's i-models deliver this information mobility while ProjectWise secures it. Together, they ensure information mobility with integrity.*



i-models *Deliver* Information Mobility...



Extending the reach and value of information models

Mobile Computing 2012

- Changing the way we live and work



Bentley Navigator for the iPad



- For project managers and construction field workers
- Synchronizes with ProjectWise
- Meta-data and files
- Provenance
- Dis-connected/
Connected modes
- Passport licensing

Introducing “Mobile i-models”

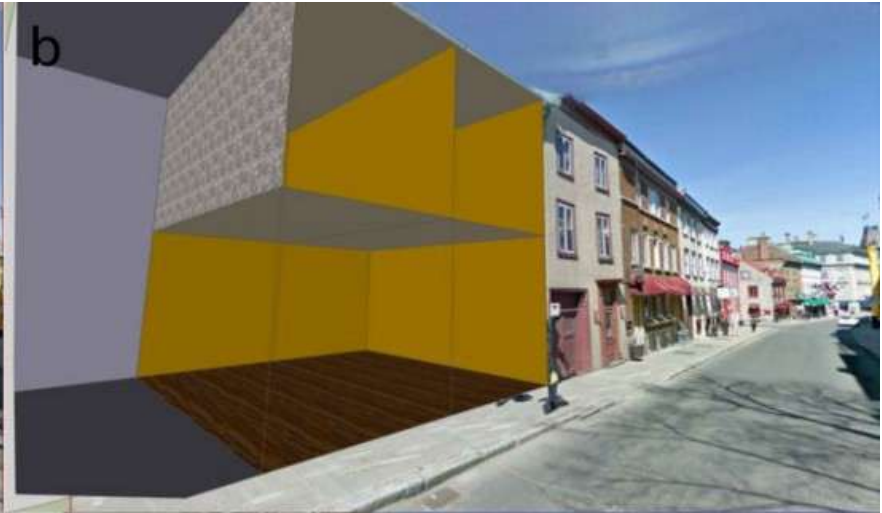


Mobile i-models

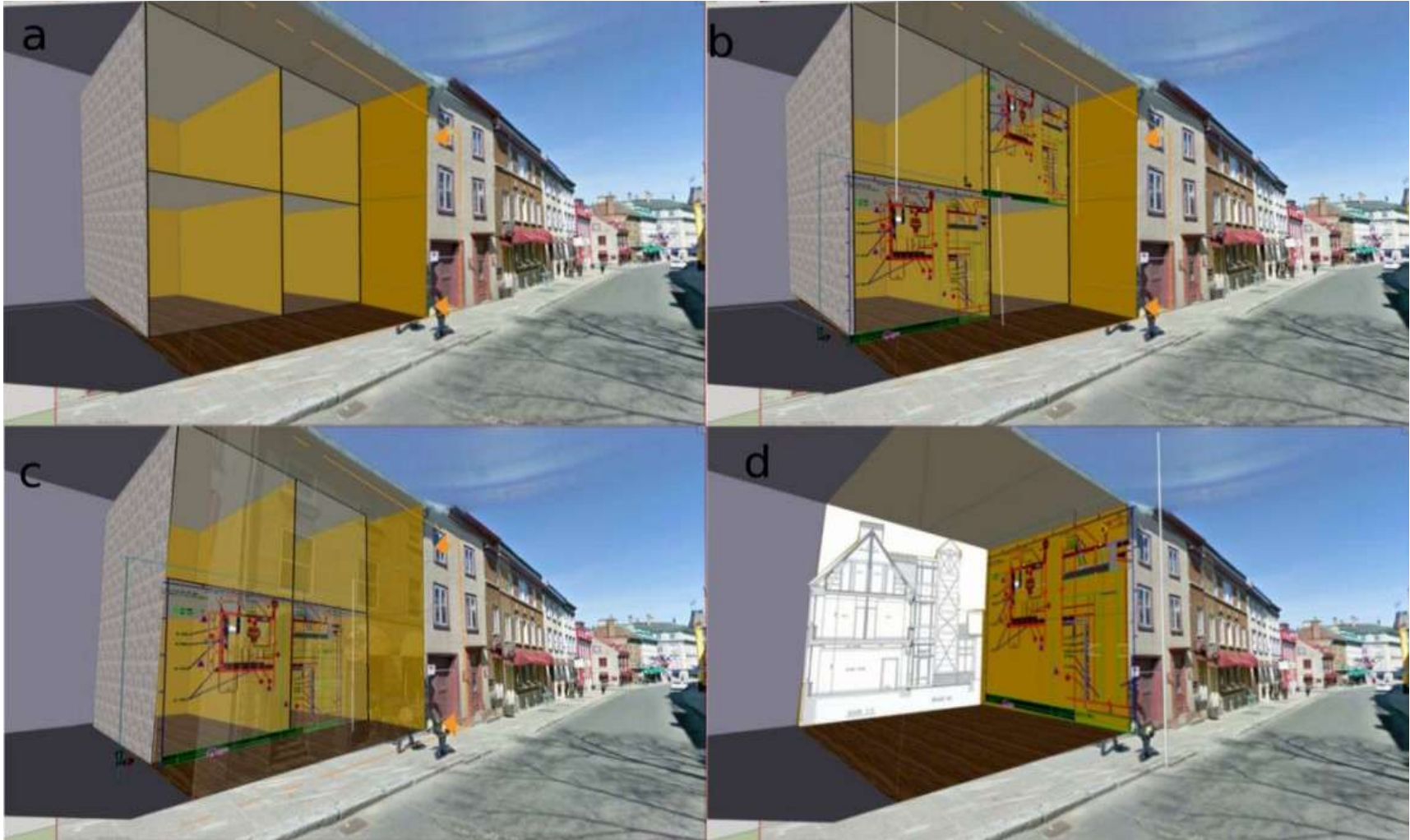
- Information Mobility
- Information Accessibility
- Information Harmony
- Your Apps coming soon...



Applied Research - Augmented Reality



Applied Research - Augmented Reality



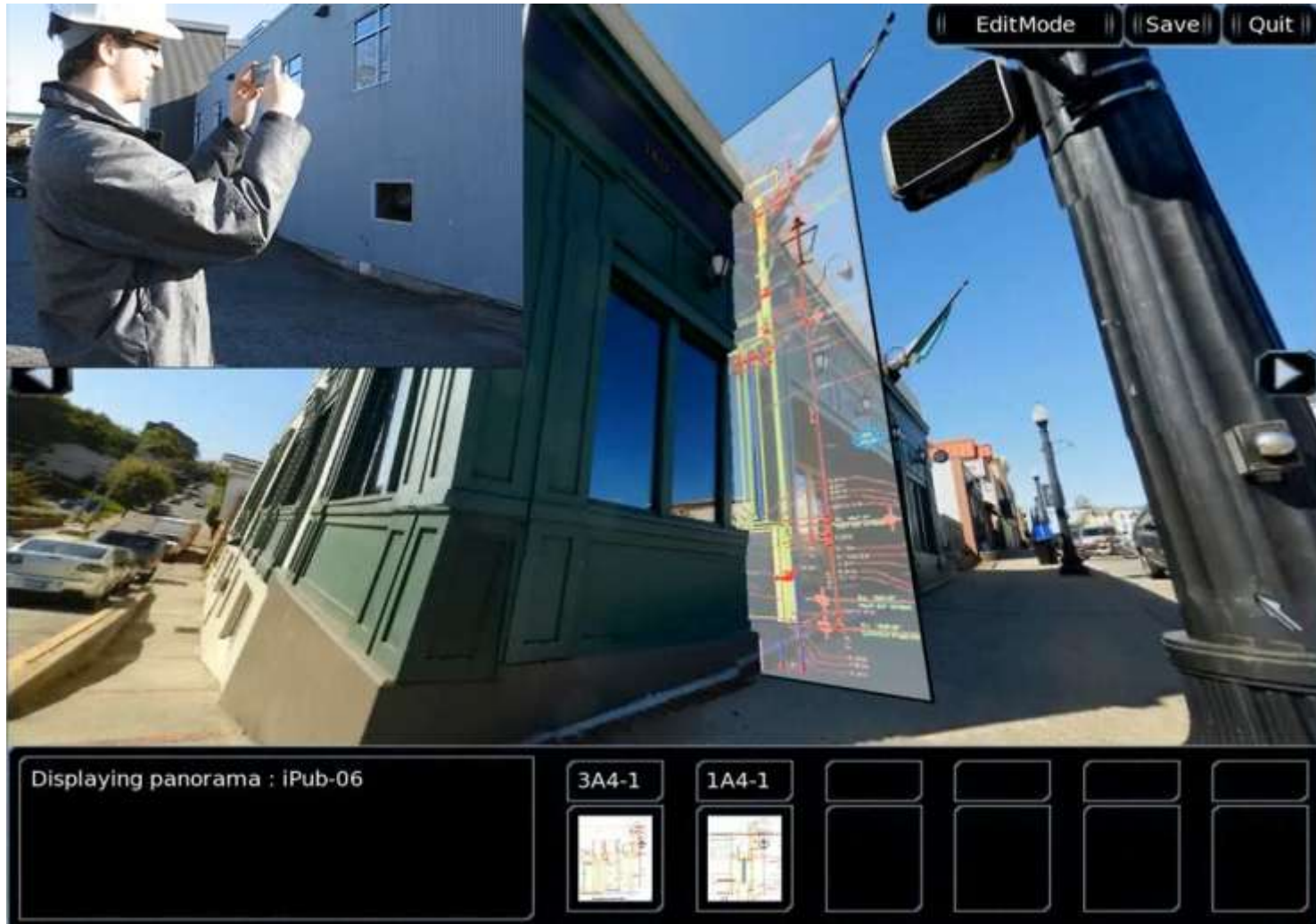
Applied Research - Augmented Reality



Applied Research - Augmented Reality



Applied Research - Augmented Reality



Applied Research - Augmented Reality



Applied Research - Augmented Reality



MicroStation®

An unrivaled **information modeling environment** for architecture, engineering, construction, and operations for all infrastructure types...



...that can be used as both a **software application** and as a **technology platform** for discipline-specific applications.



Immersive Interaction and Performance Simulation with MicroStation V8i (SELECTseries 3)

Chris Bober, Director of Product Management