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**
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.
Comprehensive Breadth & Depth

- Unparalleled richness in geometry and information
Comprehensive Breadth & Depth

- Federation and integration of design data

- Discipline-specific rigor
- Appropriate for the task
- Large & complex or typical
- In a pragmatic way

In Native Location / Google-Like

- Rhino
- SketchUp
- DWG
- DGN
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

- Models
- Drawings and Details
- Visualizations/Renderings
- Diagrams/Tabular Reports
- Active Data Exchanges/Queries
Immersive Interaction

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

Hyper modeling enables interrelated design information to be presented directly within spatial context of the 3D model.
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
Hypermodels in Construction and Operations
Item Sets

Pain: Similar objects cannot 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
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
Immersive Interaction with Point Clouds

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

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3D Modeling from Point Cloud
Retrofitting – Simulate equipment replacement
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 fundamental data type, are set to change the way everyone does business.
## Bentley Point Cloud Support

### Bentley Pointools V8i
- Animation / Movie
- Edit colors
- Convert
- Clash Detection
- Animation / Movie
- Segment/Classify
- Visualize
- 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 V8i (SELECTseries 4)
Point Clouds on the iPad
Information Mobility with Point Clouds

Phase I - Complete

- MicroStation, Navigator, Civil, Geospatial, Plant, Building Products
  - View, manipulation controls of Point Cloud
  - Third Party API’s
  - Fast, reliable native data type

- ProjectWise SS4, Bentley Geospatial Server SS4
  - Point Cloud management
  - Point Cloud streaming to Bentley Desktop clients

- Bentley Descartes and advanced industry products
  - Classification Editing/Creation
  - Element Draping & Snapping
  - Flashlight & Dynamic Sectioning
  - Tile export (Las, XYZ, POD)
  - Advanced Snapping (edges, breaklines)
  - Plane & Cylinder fitting

- MicroStation, Navigator, Civil, Geospatial, Plant, Building
  - i-model Publishing
  - E57 Import
  - Rendeing with luxology
  - Export to POD
  - Third Party API’s enhancement

Phase II – in Progress

- Navigator for iPad & GeoWebPublisher
  - Panoramas containing Point Cloud & Features

- ProjectWise / Bentley Geospatial Server
  - Improved Point Cloud streaming
  - Connectors with Oracle

- Bentley Descartes and advanced industry products
  - 3D images
  - Advanced clipping tools
  - Scan location
  - New display styles
  - Automatic breakline extraction
  - Automatic terrain classification
  - ...

Phase III Beginning in 2013

- microStation, Navigator, Civil, Geospatial, Plant, Building Products
  - Clash Detection with Point Cloud
  - Third Party API’s enhancement

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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

- Geometry/Data
- Relationships/Constraints
- Behaviors
- Spatial Location
- Thematic Display
- Design History
- Point Cloud / Raster
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
Generative Design

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

- Design creativity

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

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

![Excel screenshot](image-url)
Environmental Impact
Traffic and Safety
Louis van Amerongen
Designer, Witteveen+Bos
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
Facility Performance

- Group objects by construction status for design review
- Link details, specifications, or other content to sets of items
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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
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Displaying panorama: iPub-06
Markers: 1A4-1 is now displayed
An unrivaled information modeling environment for architecture, engineering, construction, and operations for all infrastructure types...

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