Bentley Descartes V8*i* (SELECTseries 5)

Point Cloud Processing and Scalable Terrain Models

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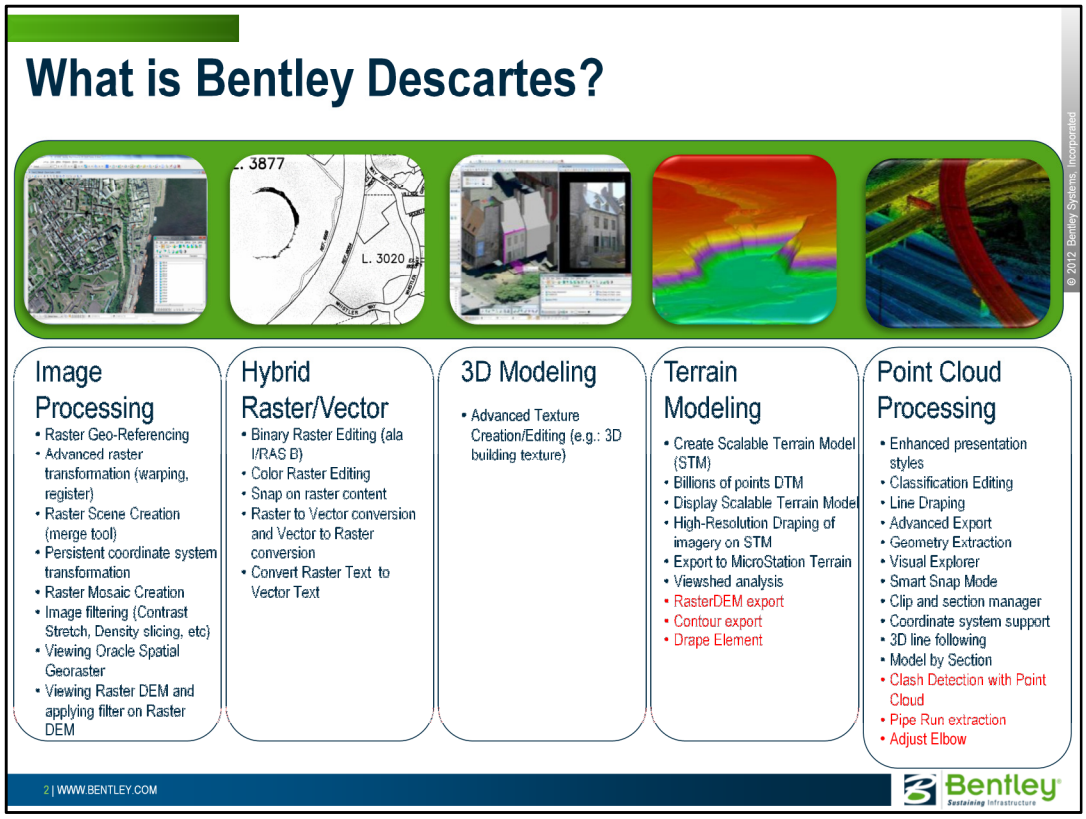

point-cloud class management for any type of presentation style – This enables the flexible display of classes and decreases the need for data conversion, reducing the time required for classifying points.

new presentation styles that can be configured, saved, and managed – This enables quick switching from one display configuration to another, improving object recognition and reducing the time spent viewing, understanding, and manipulating point clouds.

the ability to expand beyond the 13 classes of the LAS file format by defining custom classes (e.g., classification methodologies used in the plant or building industries) – This enriches the point-cloud data, increasing its value.

the ability to create and easily manage clips and sections (e.g., toggle on/off clips or sections) – This makes point-cloud manipulation and review easier, especially when extracting geometries, and shortens the time needed to configure views and analyze point-cloud data, particularly in geometry extraction workflows.

support for geographic coordinate systems – This enables users to integrate point-cloud models from different coordinate systems. These capabilities help enhance the overall project point-cloud model, improving the quality of point clouds and ultimately increasing the return on investment in point-cloud data, even if the data is from different geographic coordinate systems.

the ability to extract linear features with a new set of tools, such as model by section and 3D line following, which are suitable for myriad feature types, from road gutters to tunnels or rails – This makes the extraction of linear feature geometries and the quality control process more efficient and increases the value users get from point clouds.

What's new in V8i (SELECTseries 5)

- Point Cloud Processing
  - Clash Detection with Point Cloud
  - Piping tools
    - Extract Piperuns
    - Extract Cylinder by a single click
    - Elbow creation
    - Adjust Elbow
- Scalable Terrain Model
  - RasterDEM export
  - Drape Element
  - Contour export

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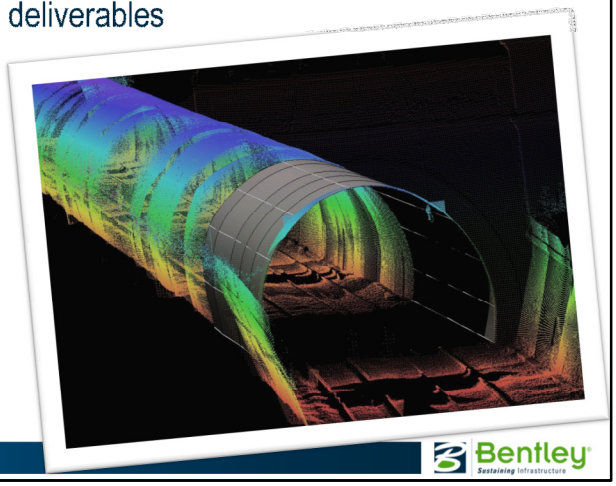
Why you need Descartes for Point Cloud

- Need to leverage point cloud data on engineering projects
- Need to fix point cloud classification mistakes and to clean-up point clouds
- Need efficient tools to extract features from point clouds
- Assess design against point clouds
- Difficulty understanding very dense point clouds
- Need to produce point cloud deliverables



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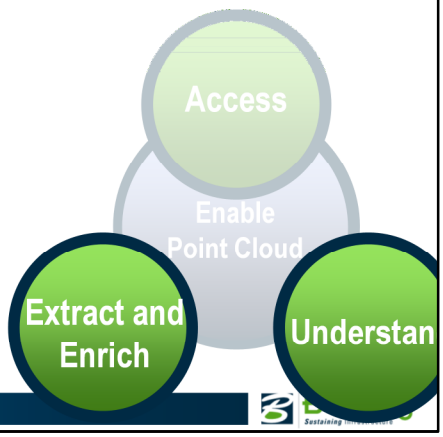
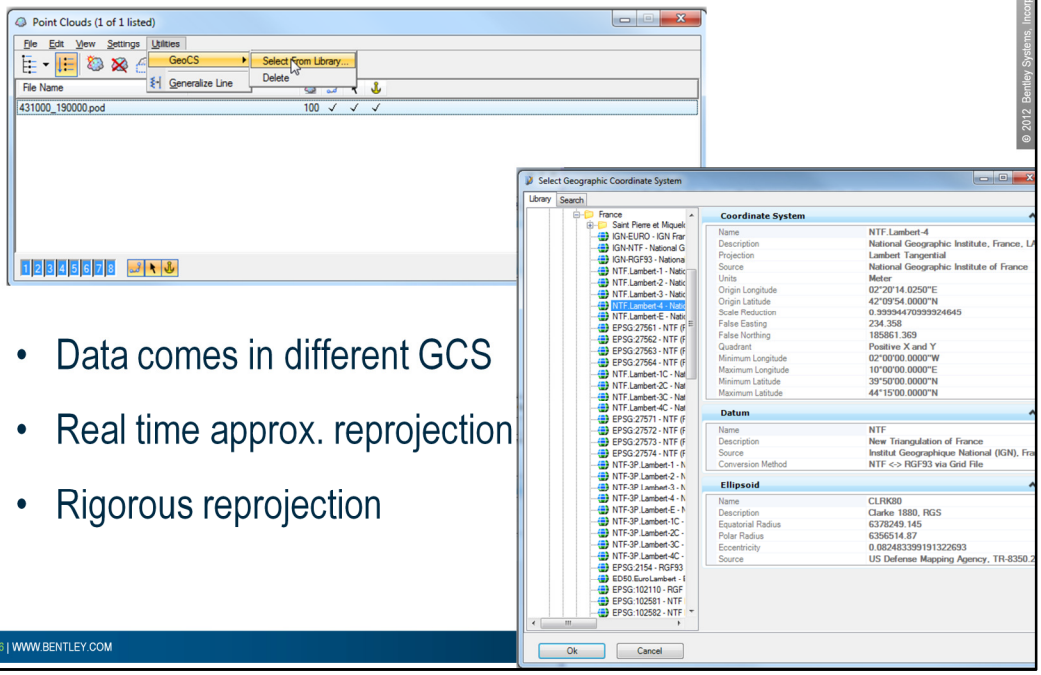
Bentley Descartes - Point Cloud Processing

- Geo-coordination
- Enhanced presentation styles
- Clip Manager
- Section Manager
- Classification Editing
- Visual Explorer
- Smart Snap Mode
- Line Draping
- Snap Elements
- Cylinders, Piperuns & Elbow
- Planes Extraction

- Automatic 3D line following
- Model by Section
- Clash Detection
- Advanced Export



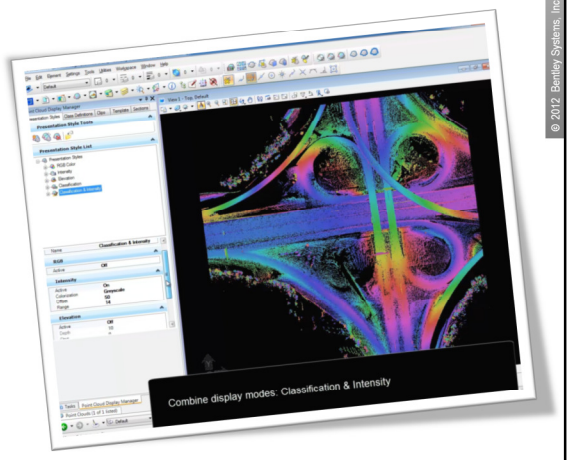
Geocoordination



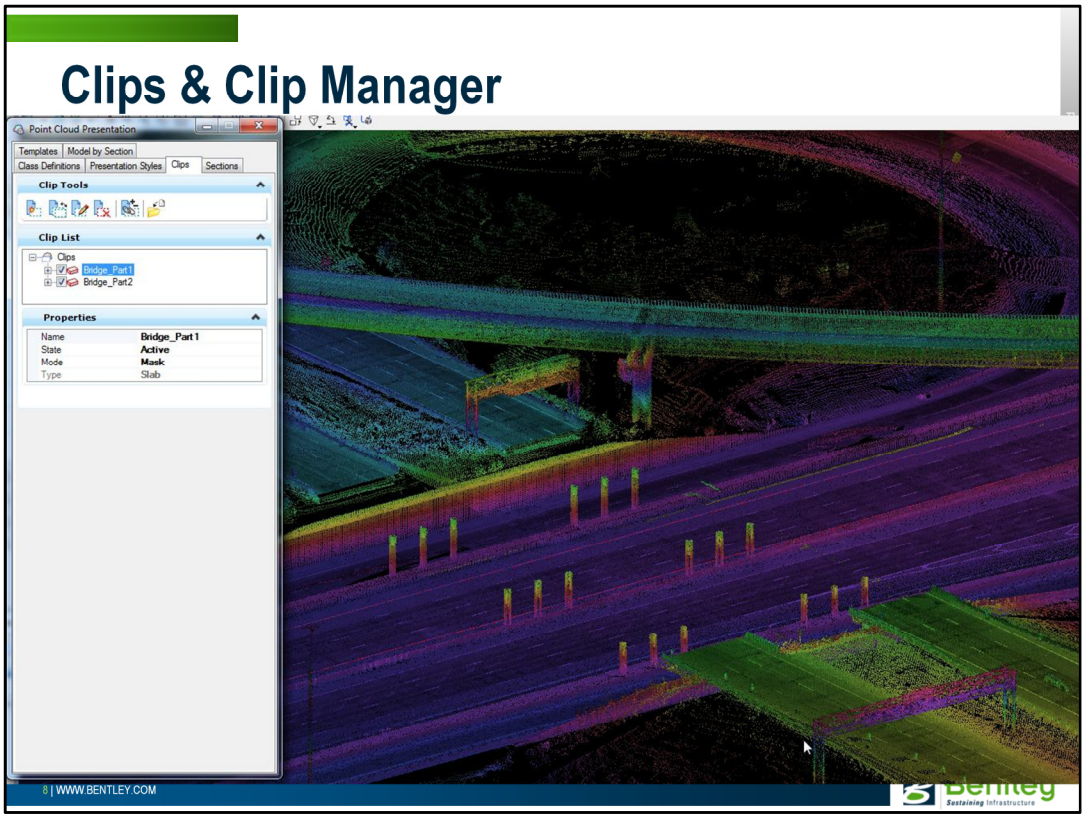
- Data comes in different GCS
- Real time approx. reprojection
- Rigorous reprojection

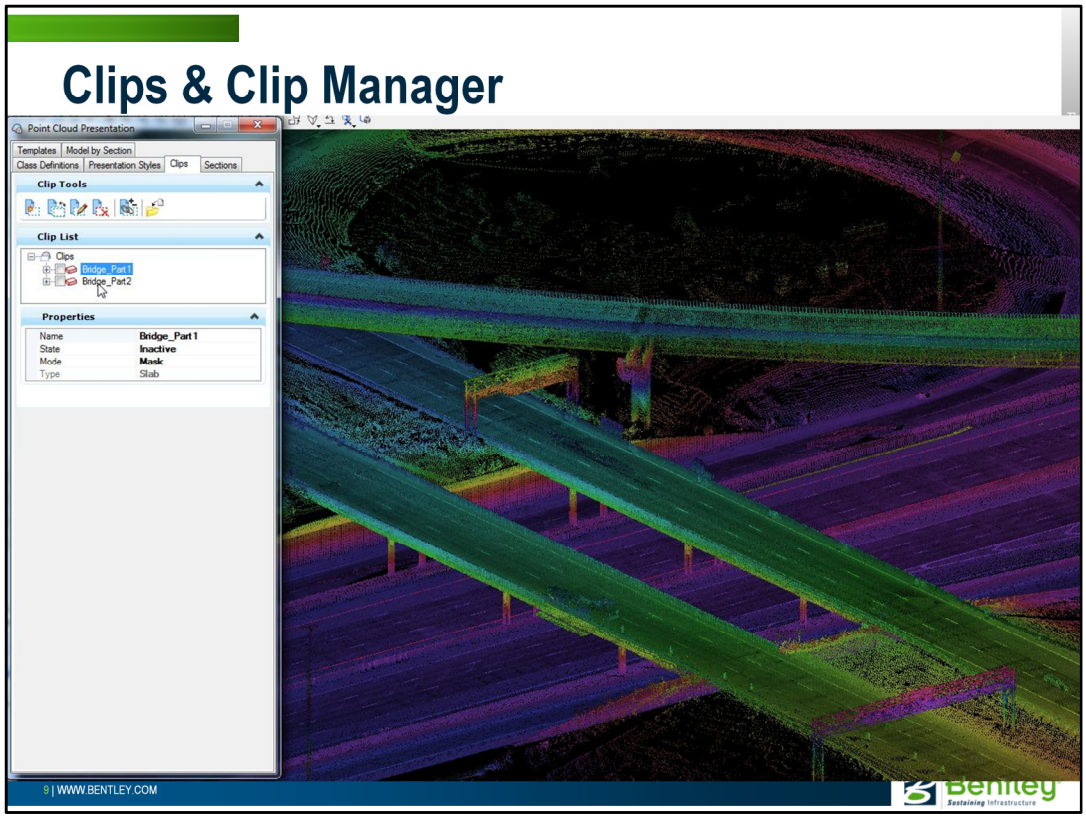
Presentation Style Manager

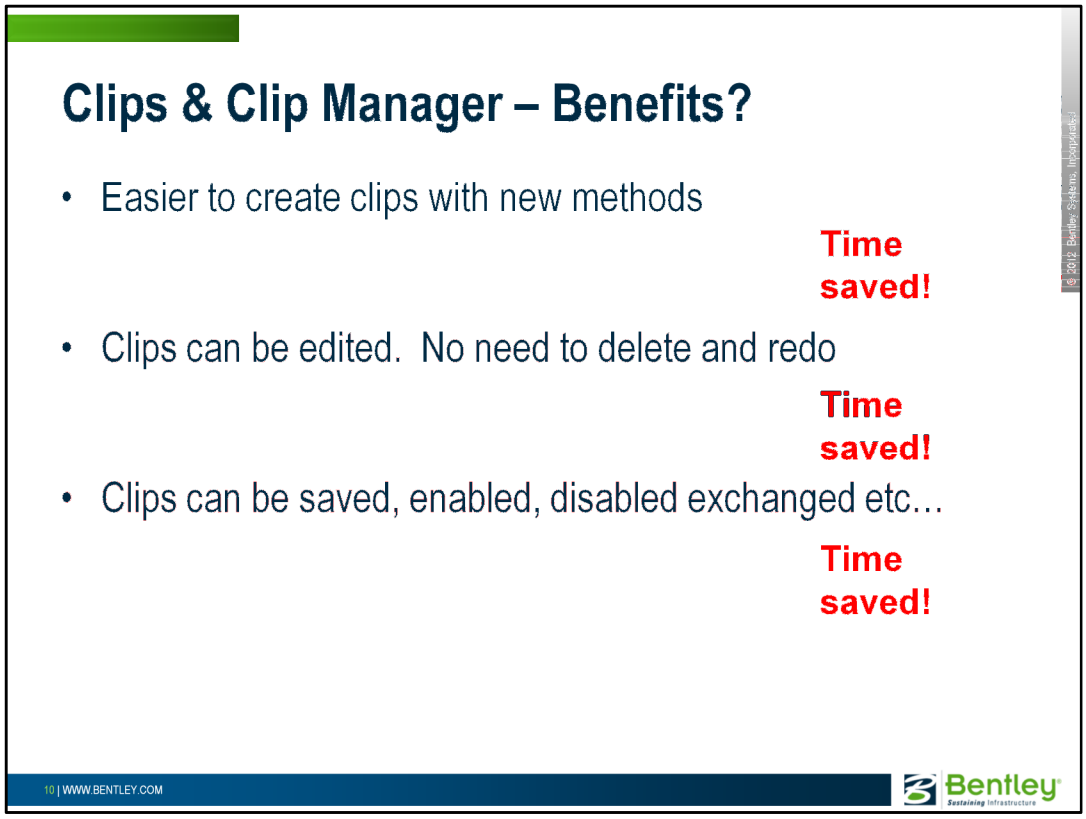
- Presentation styles allow the combination of several modes
  - Intensity & Elevation
  - Intensity and Classification….
- Custom classes can be created
- Point-cloud class management is now available for any type of display style. User can toggle on/off classes with all display modes
- New display styles can be configured, saved and exchanged in a Style Manager



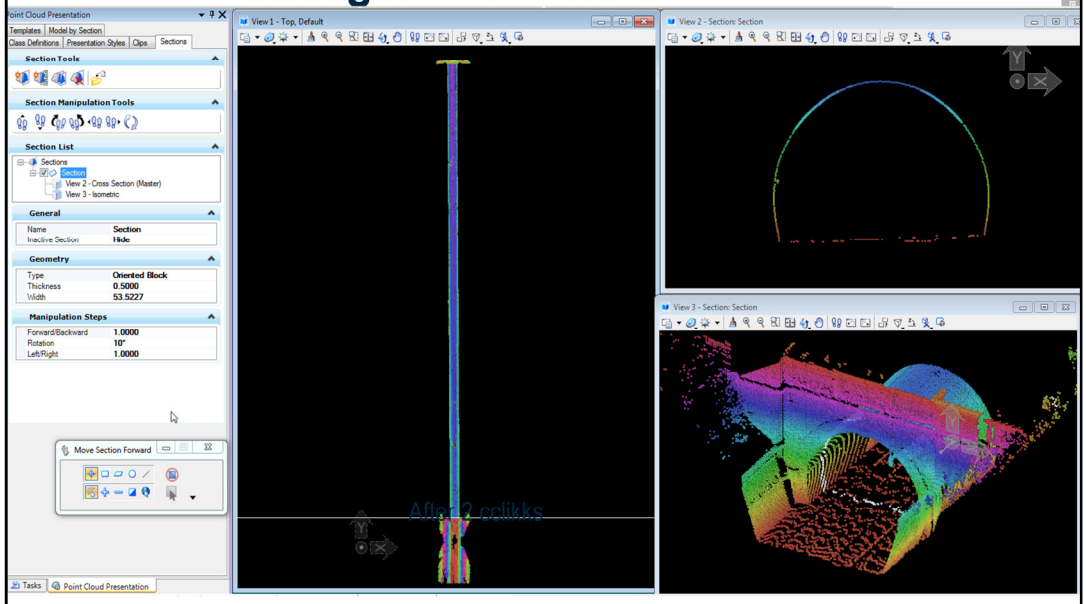
Clips & Clip Manager







Section Manager – What is it?



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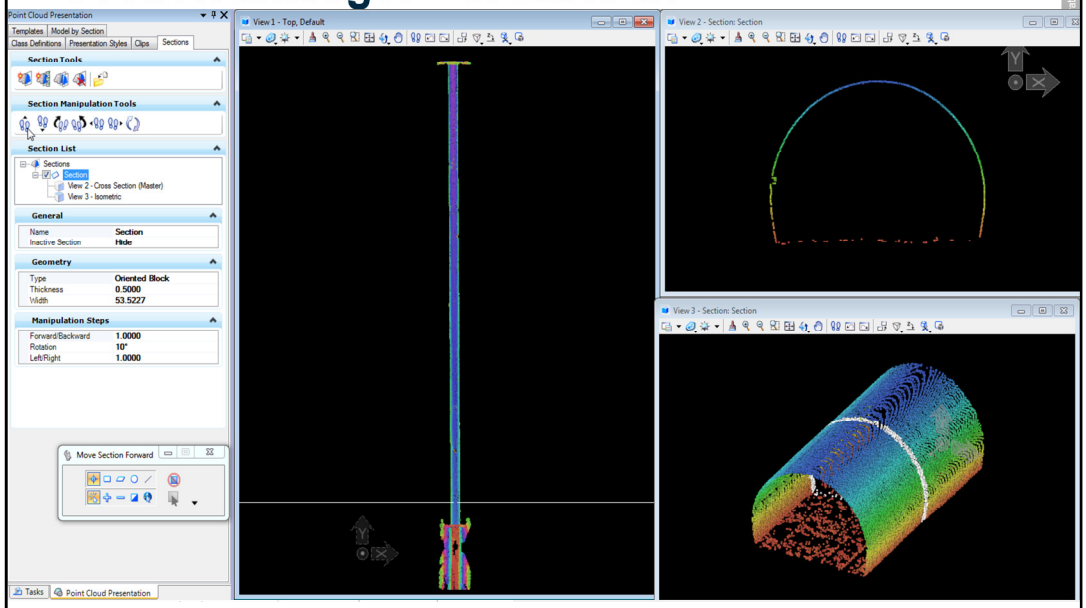


Section & Section Manager

- Extremely fast way to slice point cloud per view
- 3D Made easy: section concept allows straightforward digitizing in section planes
- Section are easy to manipulate: move, rotate etc…
- Views automatically synchronized

Time saved!

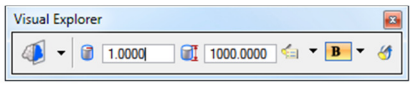
Automated classification software often introduces errors in point cloud classification

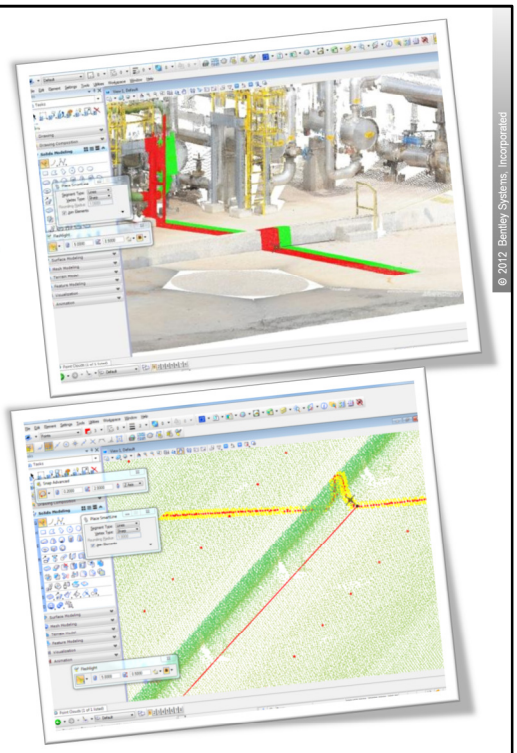
Benefits:

Save time and money by empowering users to fix simple mistakes not detected by automated process
Improve point cloud data quality by improving the classification thereby adding value to existing data
Improve downstream processing of point clouds with accurately classified data
Facilitate hybrid workflows combining point cloud and vector based data

Visual Explorer

- Patent pending technology
- Visual helper dynamically re-coloring points in the cursor neighborhood
- Simplifies understanding of complex point clouds





Benefits:

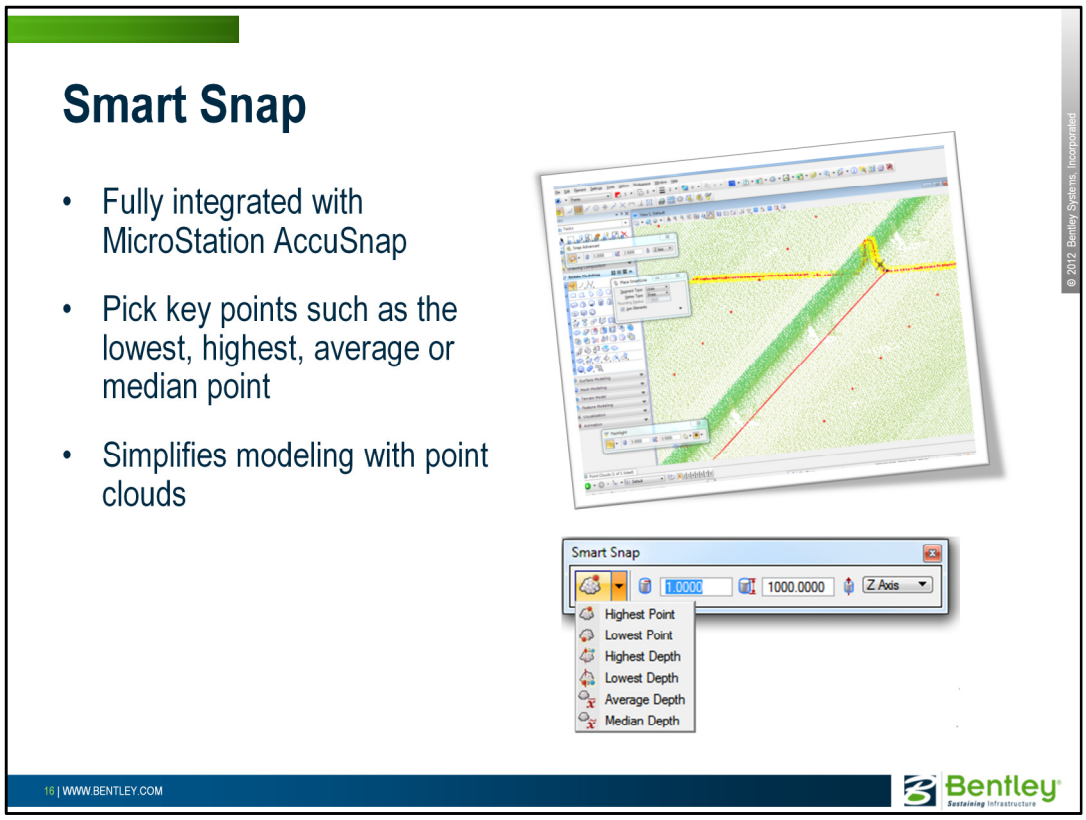
Enable better understanding of a 3D scene

Provides a dynamic cross section capability

Enable simpler QA/QC of the point cloud data

Enable better navigation of a 3D scene

Provides faster and more accurate digitizing especially when combined with Advanced Snap



Benefits:

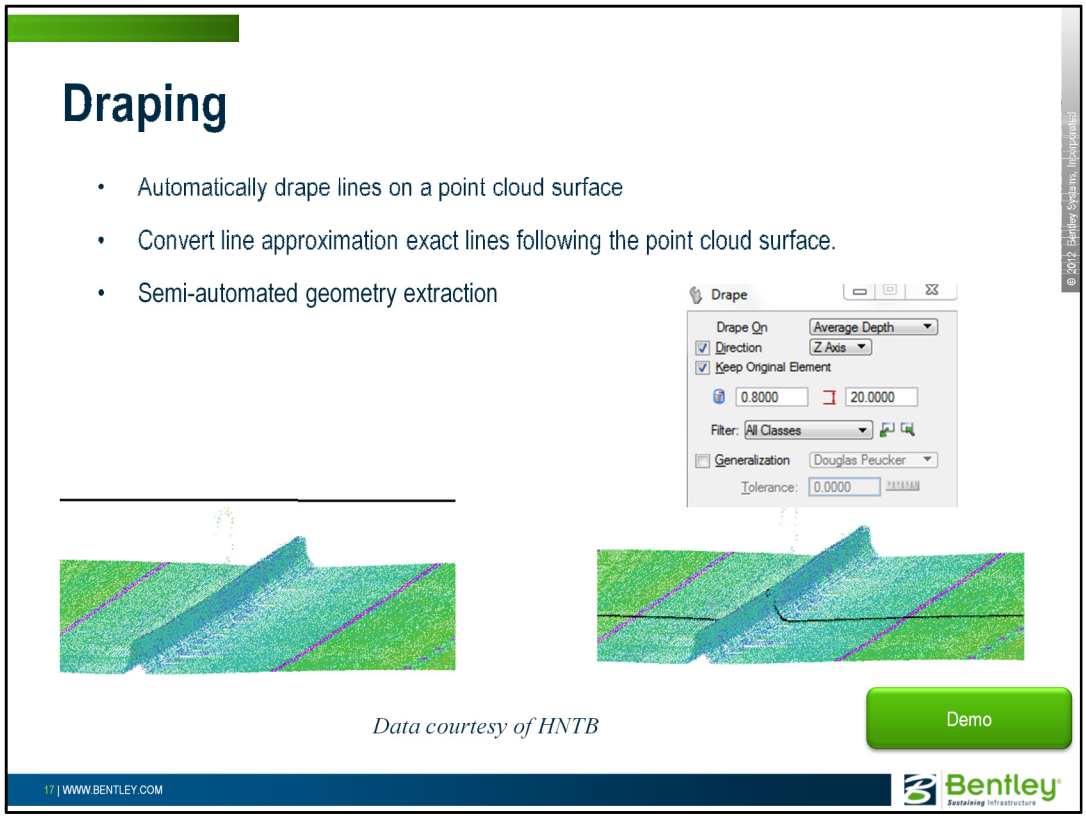
It enables:

Fast semi-automatic break line extraction

Simple feedback on the particular point the tools are snapped on in the point cloud

Easier distance measurement

Faster digitizing by reducing the number of view rotations while working



The Drape Element tool projects linear elements onto the point cloud in the direction specified in the Tool Settings.

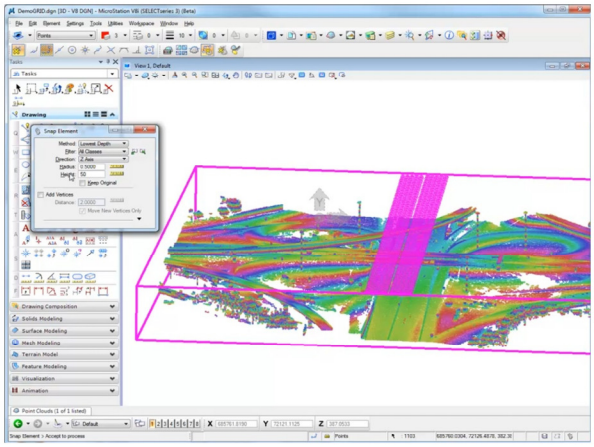
This allows users to draw a vector line that approximates the feature and then drape it to exactly follow the point cloud. It will add as many new verticies as required in order to follow the point cloud.

Draping elements can be used for semi-automated geometry extraction from point clouds, for example for getting road profiles, transmission line cables etc.

Let's see this in action.

Snapping

- Automatically snap line vertices or points
- Convert line approximation into lines following the point cloud surface exactly
- Convert random points into points exactly on the point cloud surface



Benefits:

Enable semi-automated geometry extraction from point cloud

For example

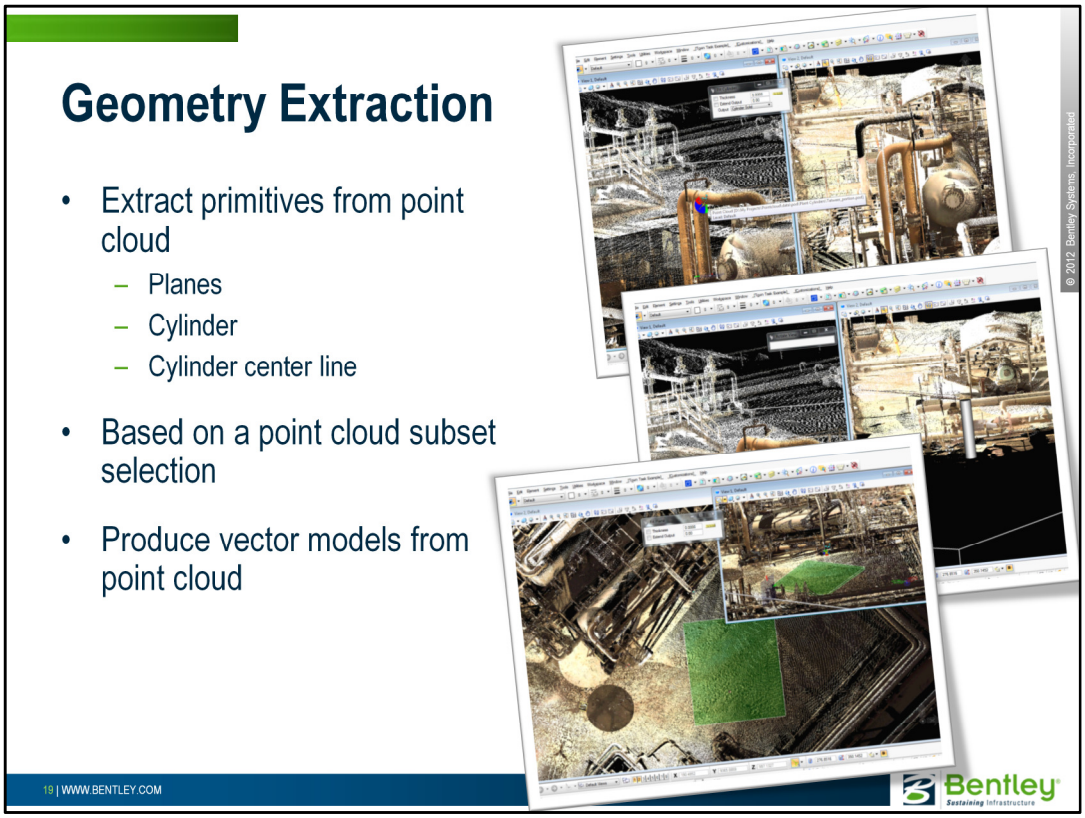
Road profiles

Transmission line cables

Etc.

Enable analysis of the extracted vector data using any MicroStation based tools

Create better terrain models by supporting the creation of break lines



Benefits:

Help creation of as-built drawing based on scanned data

Enables downstream analysis (clash detection)

Provide based geometry for further downstream intelligent infrastructure modeling

3D Line Following – What is it?

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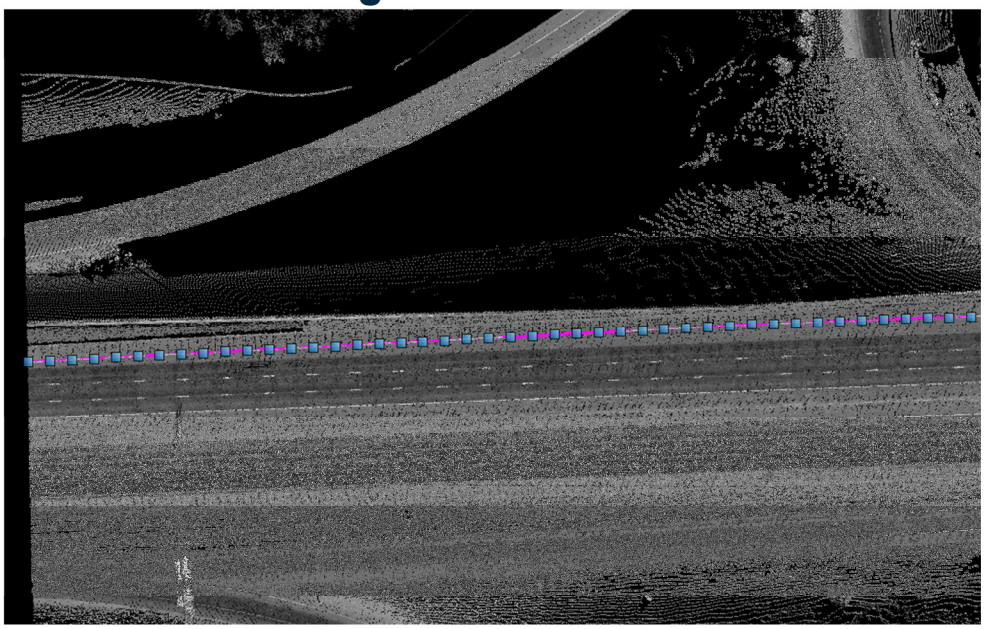
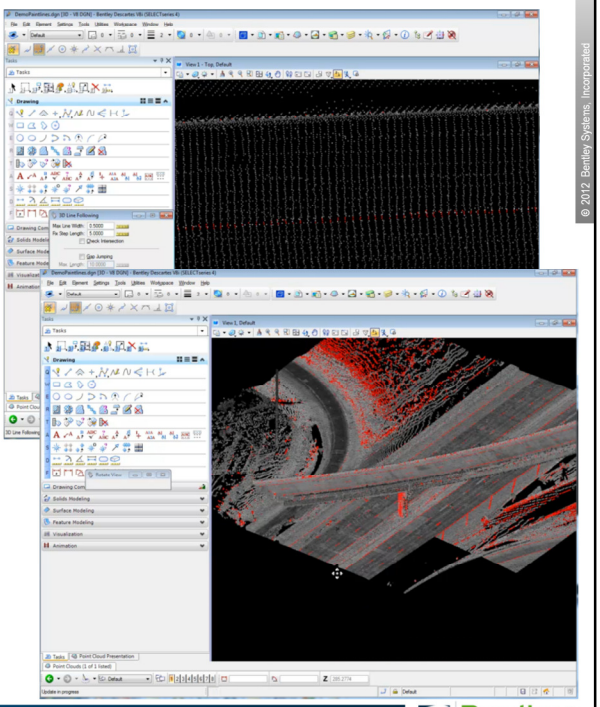


3D Line Following

- Semi-automatic tool for line following
  - Road paint line
  - Transmission lines
  - Rail lines
- Define intensity to be used by tool to follow lines
- Works with curved and broken lines



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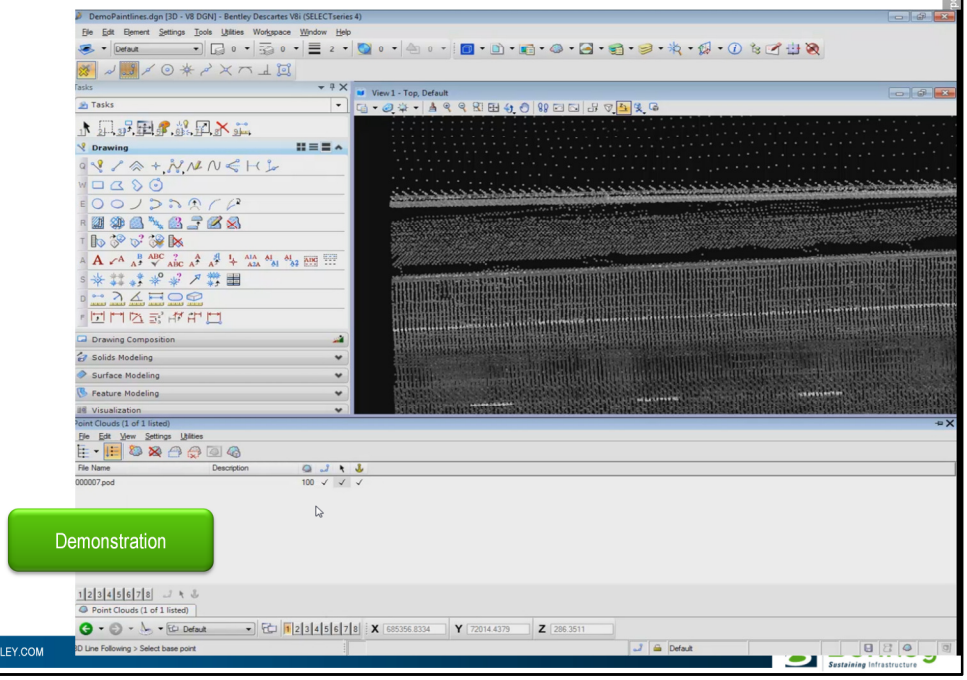
3D Line Following

- High Degree of Automation
- Real time quality control
- Applies to other 3D lines: transmission, rail

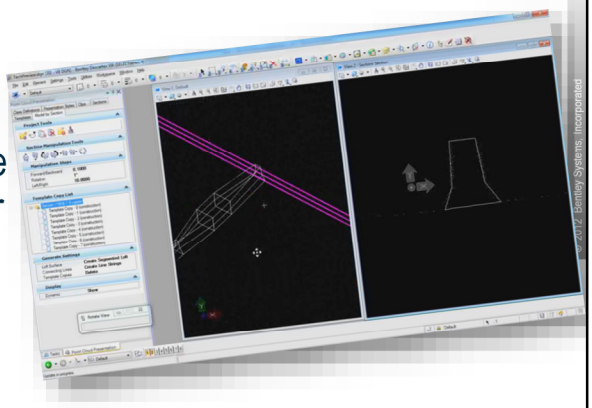
Time saved!

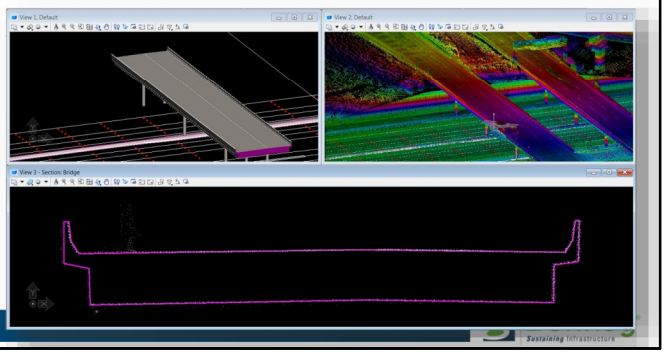
3D Lines following



Model by Section

- Define a template of the cross section of a linear feature.
- Copy and adjust the template in sections along the feature
- Directly produce :
  - Loft Surfaces
  - Lines
  - Sections





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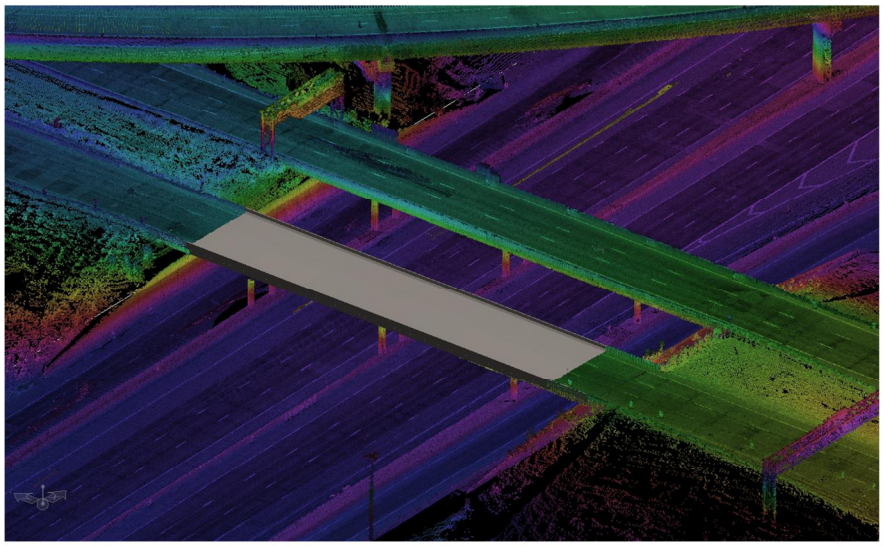
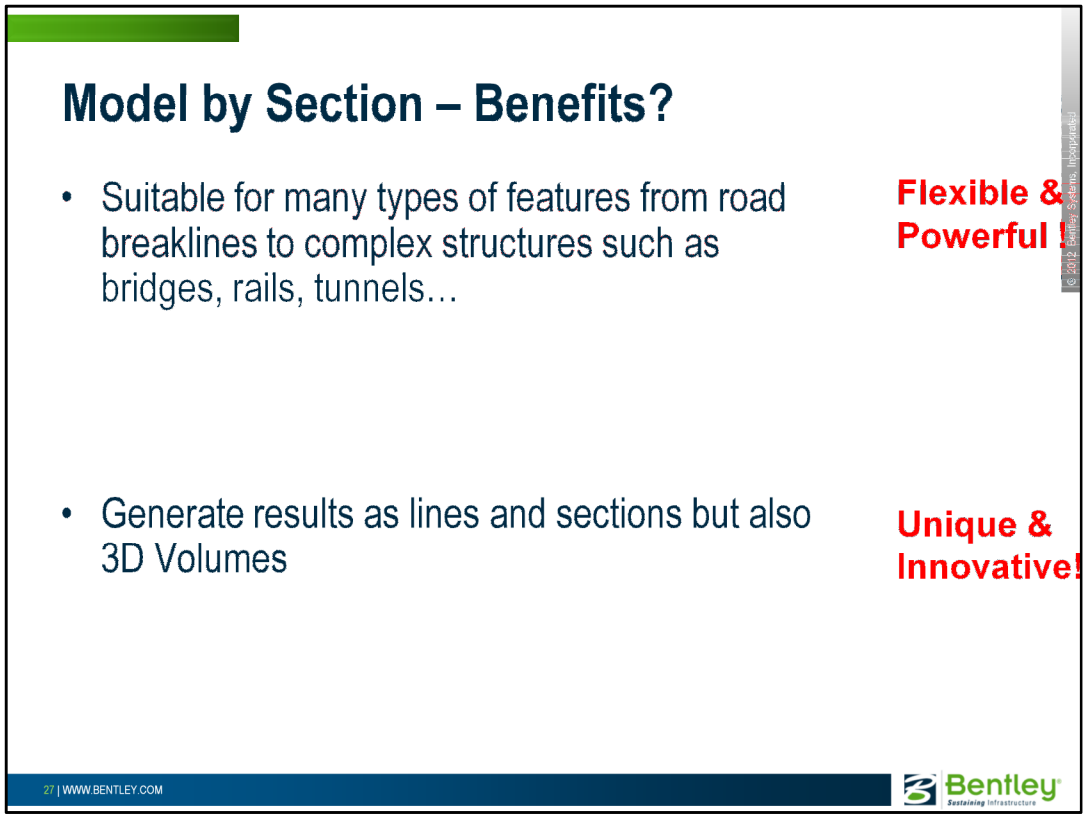
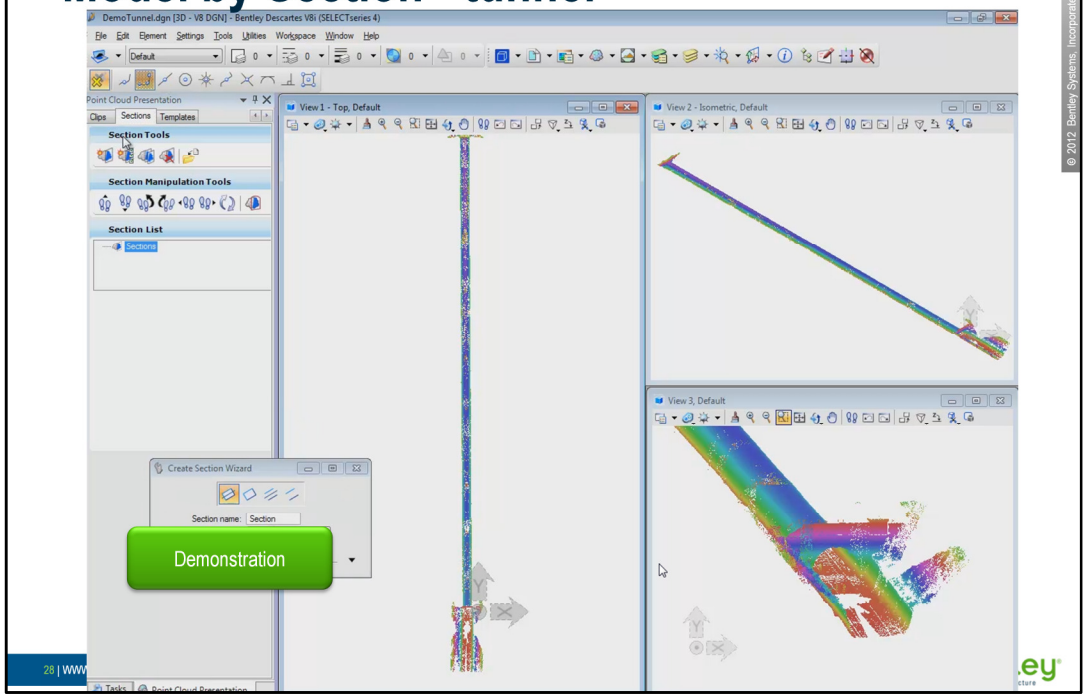
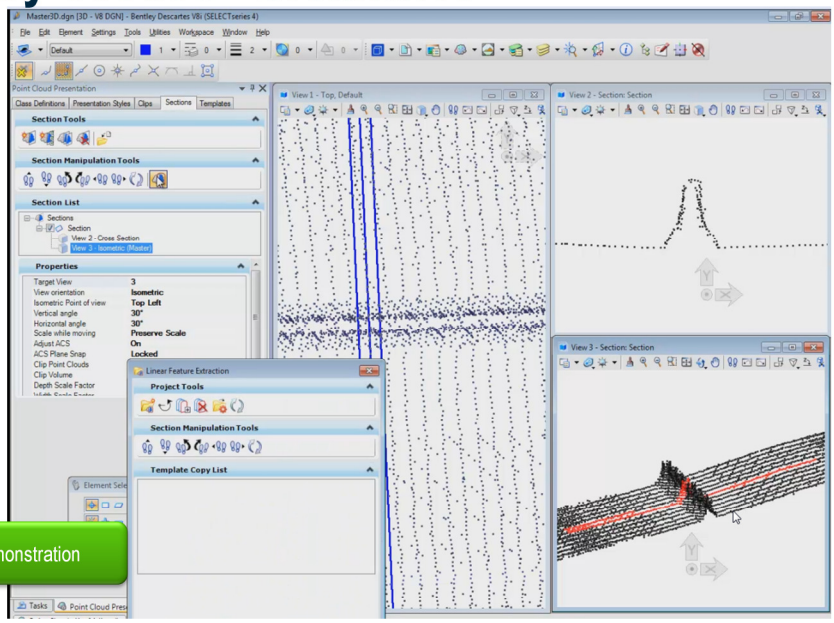




Model by Section - tunnel

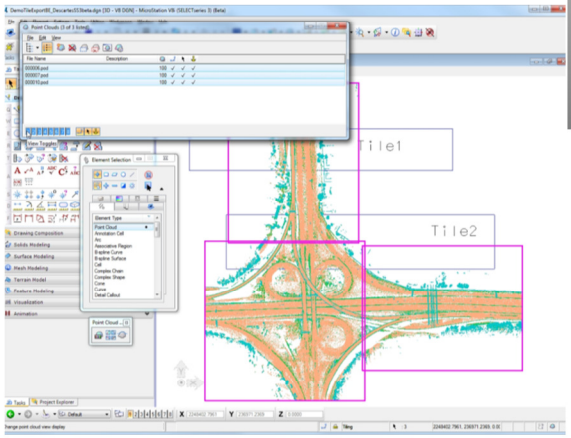


Model by Section - breaklines



Demo: Export tiles

- Export N Point Clouds into M tiled files

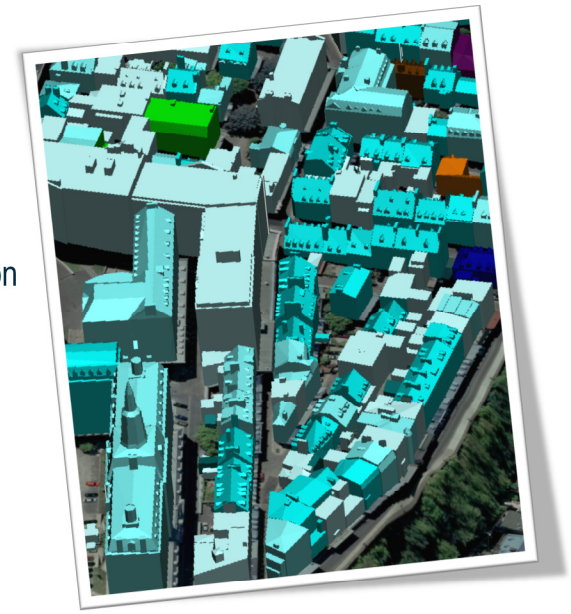


Demonstration

Data Courtesy HNTB – www.HNTB.com

Why you need Descartes for Terrain Modeling

- Large scale visualization requirements
- Need to use very large data sets in engineering projects
- Need to display high resolution imagery on the terrain



Imagery courtesy Quebec City

Scalable Terrain Model (STM)

- STM is a revolutionary new technology that enables high-performance display of digital terrain models (DTMs) covering very large areas and containing billions of points
- For viewing huge digital terrain models at geospatial scale
  - City, Region, State, Country
- Potential users
  - Municipal, States, Federal agency and government
  - EPC working in GIS
  - Large infrastructure project

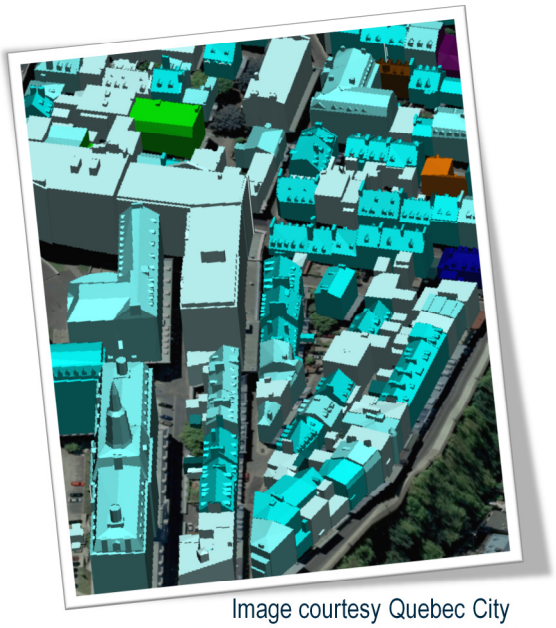
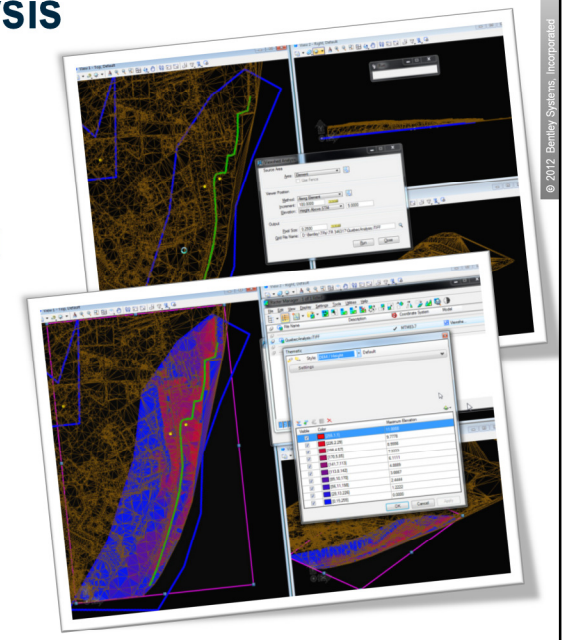


Image courtesy Quebec City

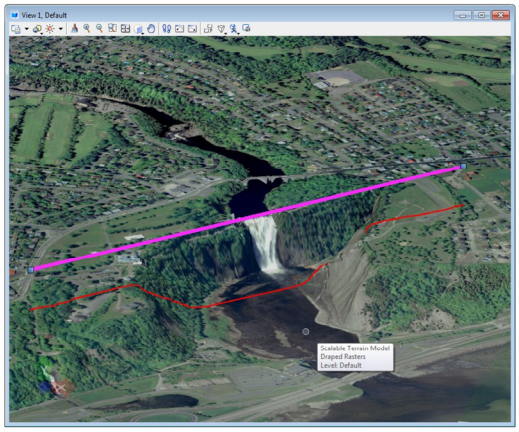
STM - Viewshed analysis

- Viewshed analysis running natively on Scalable Terrain Model
  - Full resolution of the STM for a user defined extent
- Generate a raster grid showing areas visible from selected viewpoint
- Support multiple points of view and paths



STM - Drape

- Drape linear element directly on Scalable Terrain Model
- Full resolution of the STM for a user defined extent



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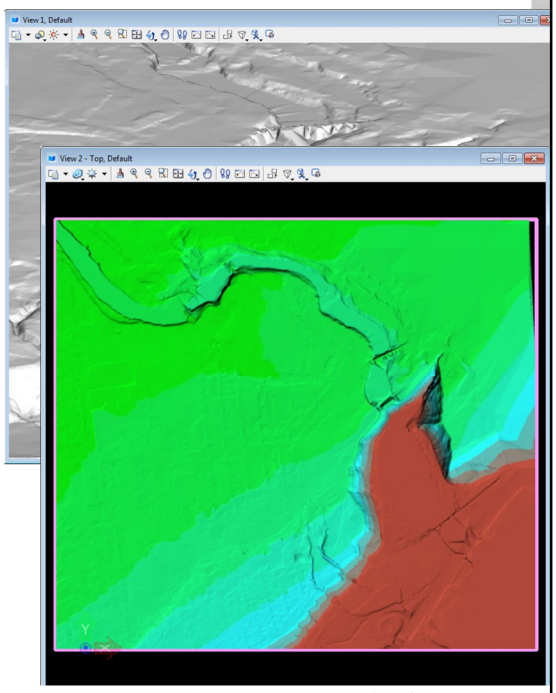
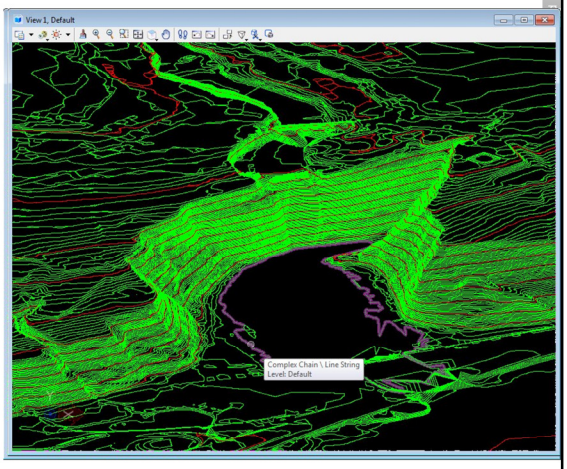
STM – Raster Dem

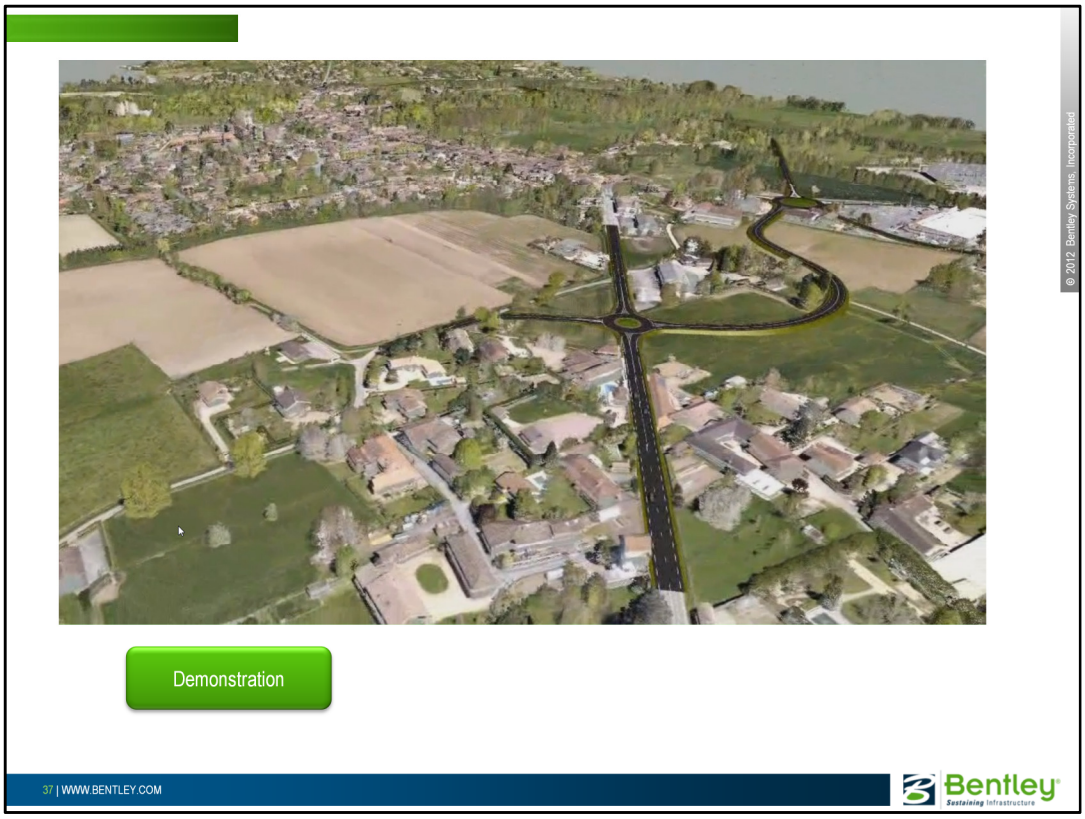
- Extract Raster DEM
- Interoperability with other GIS

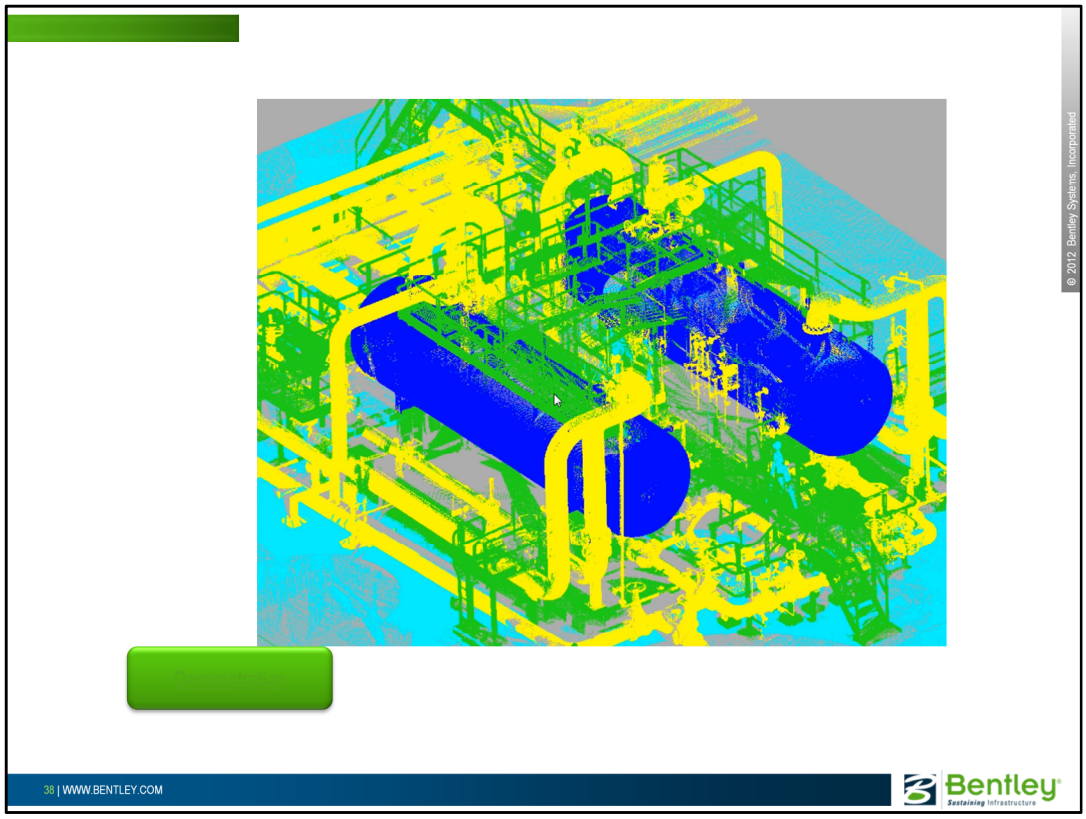


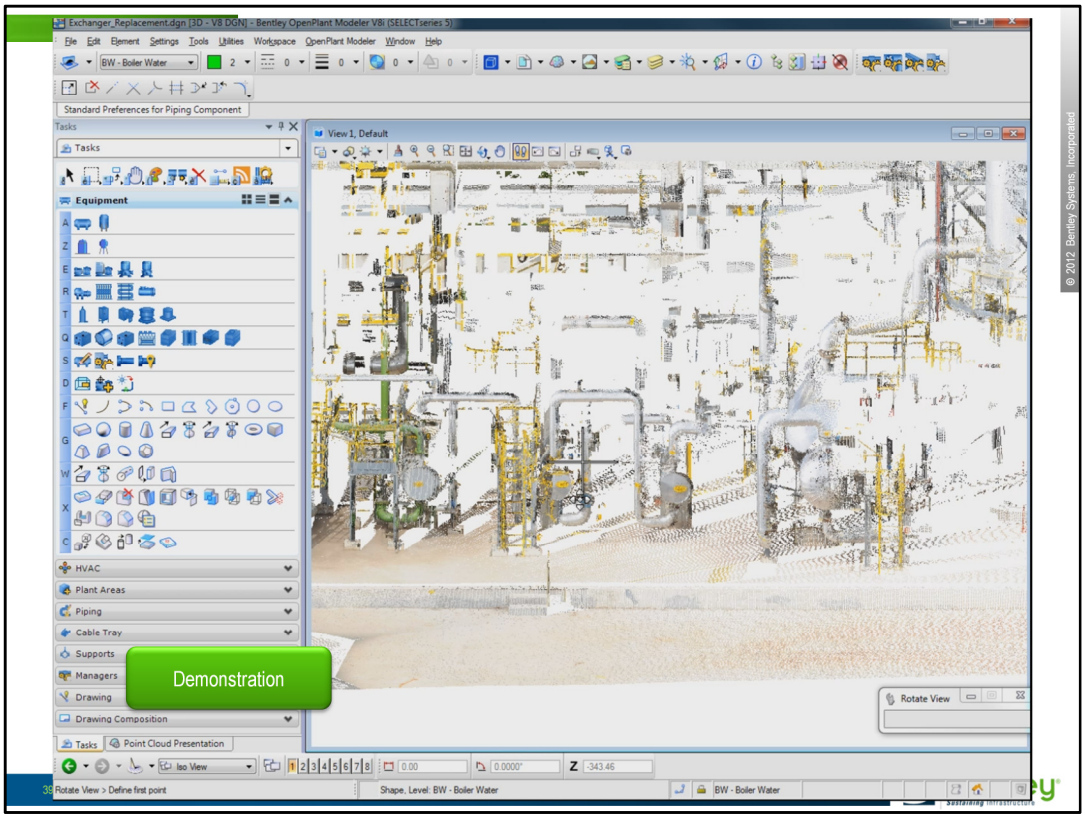
STM – Contours

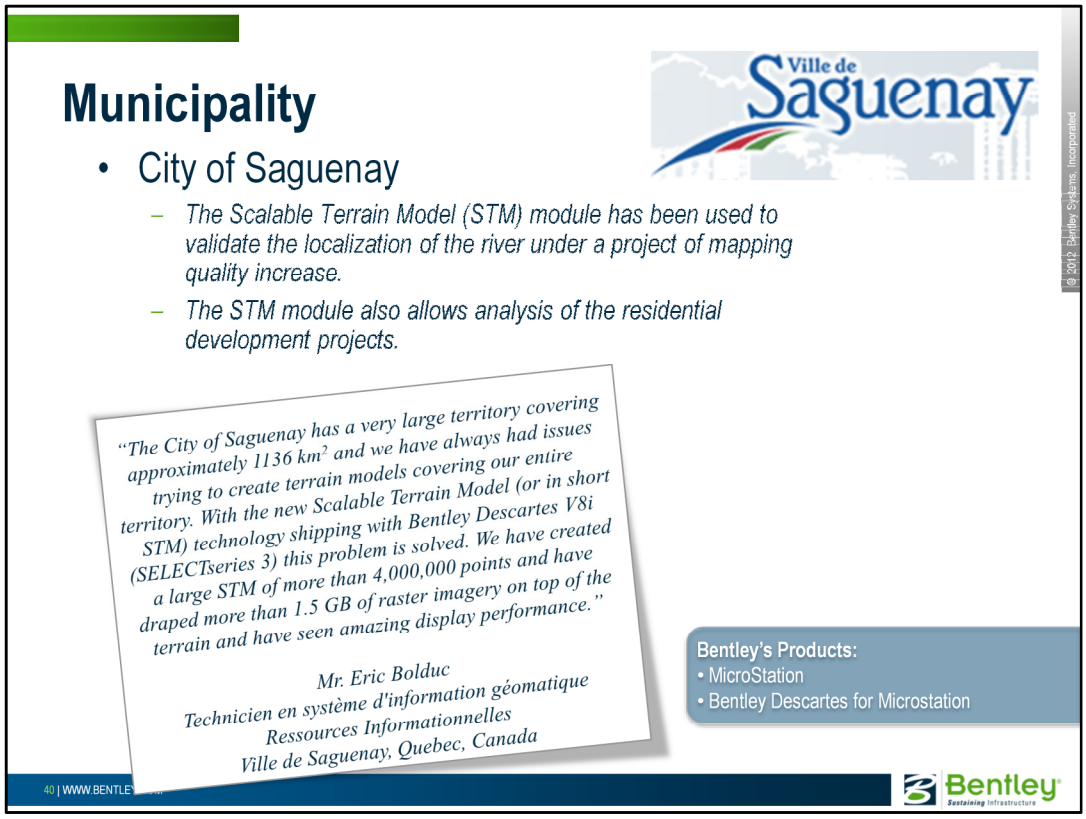
- Convert contours to MS Elements
- Enable editing









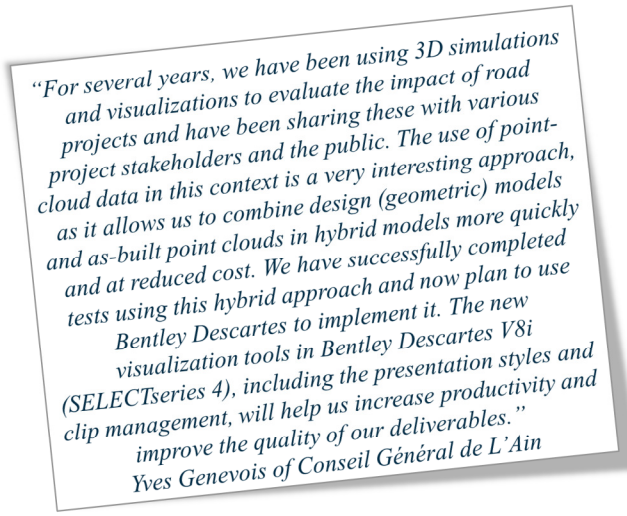


The STM module has been used to validate the localization of the river and brook under a project of mapping quality increase. The objective is to identify the presence of rivers and brooks and localize them as much precise as possible with the goal of the implementation of rules of environmental safety (shore, humid areas, etc…).

The module also allows analysis of the residential development projects. Indeed, the function allows Drape element of "dressing" the drawing with the topography of the project using the points Clouds. The report assesses the development in regard to the presence of slope, the protection of rivers, the establishment of the proposed excavation or embankment.
Finally, as part of a project to map areas prone to stress landslides, the module allowed us to validate sloped areas (orientation and degree of slope, position of the peaks and down slope) by applying polygons projected area of the STM.

Local Government

- Conseil Général de L'Ain



l'ain
Conseil général

Bentley's Products:
- Bentley Descartes

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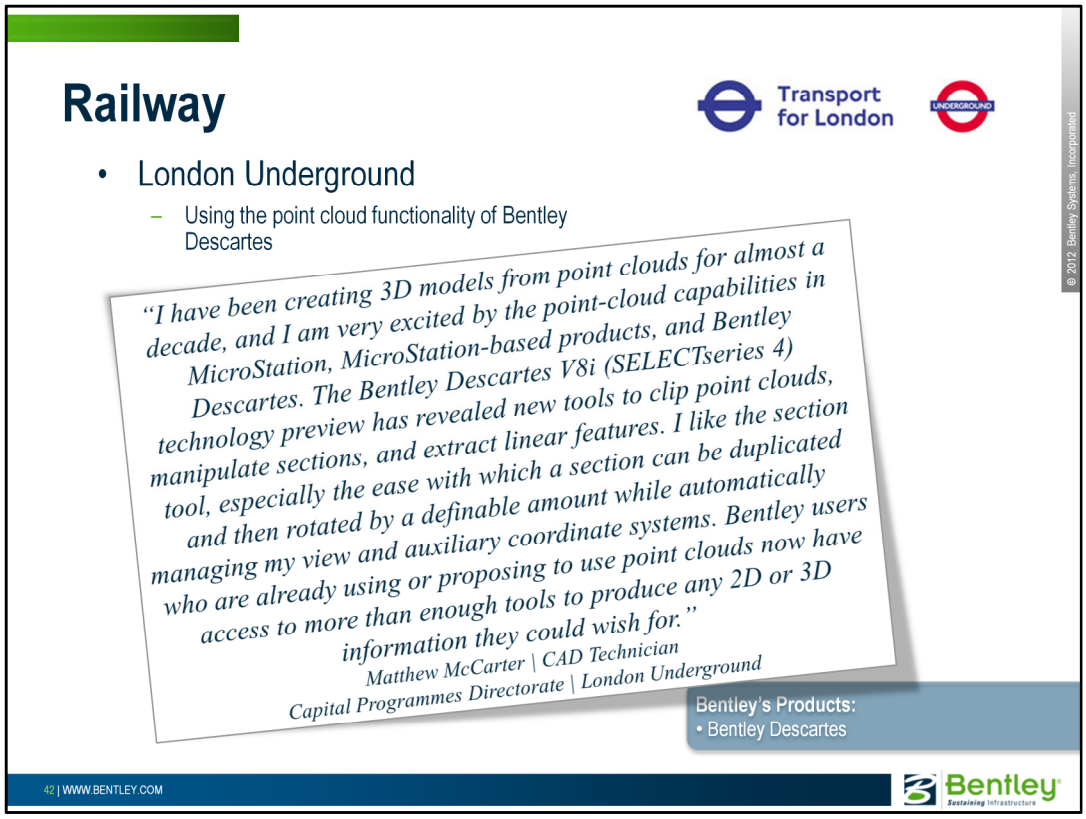
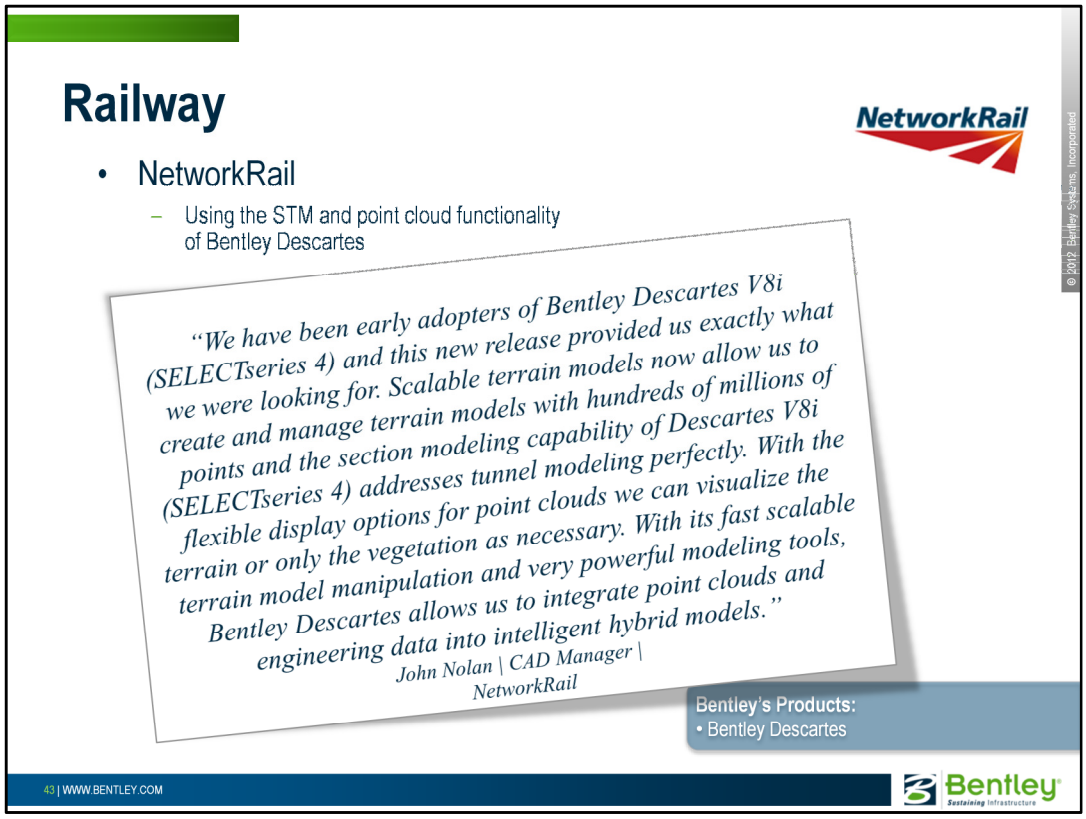


Commenting on the new release of Bentley Descartes, Matthew McCarter, CAD technician, Transport for London, said, "I have been creating 3D models from point clouds for almost a decade, and I am very excited by the point-cloud capabilities in MicroStation, MicroStation-based products, and Bentley Descartes. The Bentley Descartes V8*i* (SELECTseries 4) technology preview has revealed new tools to clip point clouds, manipulate sections, and extract linear features. I like the section tool, especially the ease with which a section can be duplicated and then rotated by a definable amount while automatically managing my view and auxiliary coordinate systems. Bentley users who are already using or proposing to use point clouds now have access to more than enough tools to produce any 2D or 3D information they could wish for."



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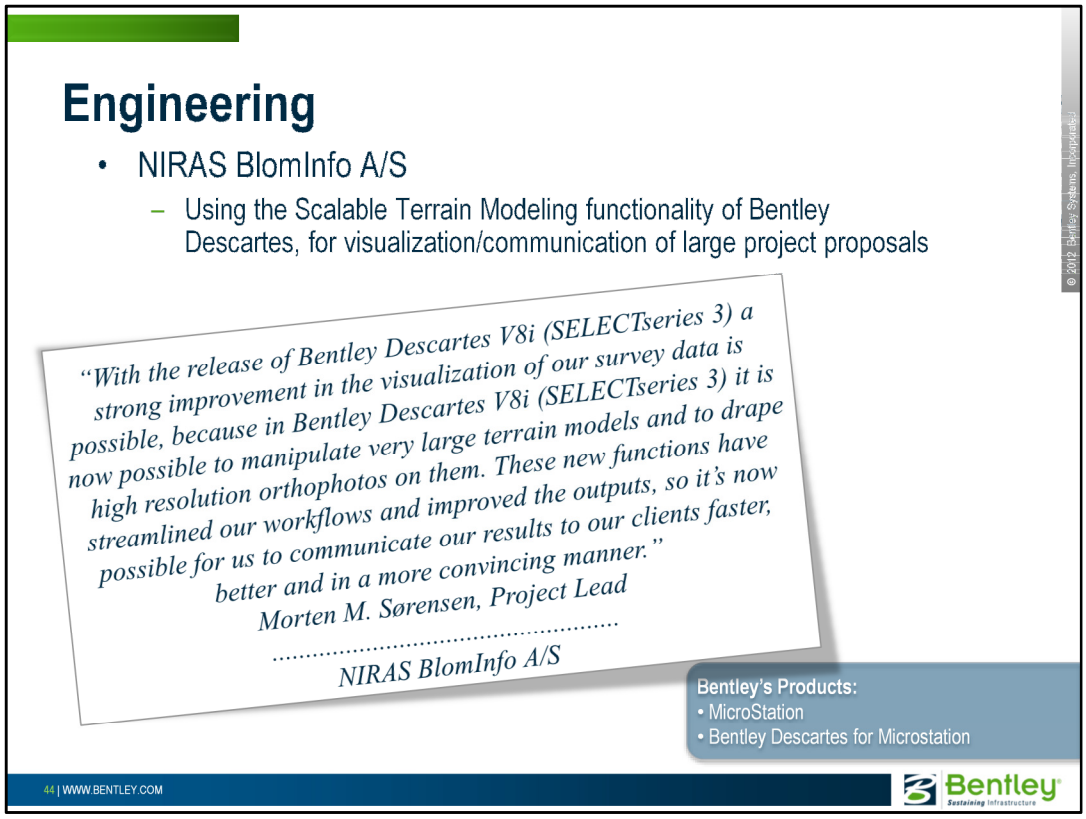
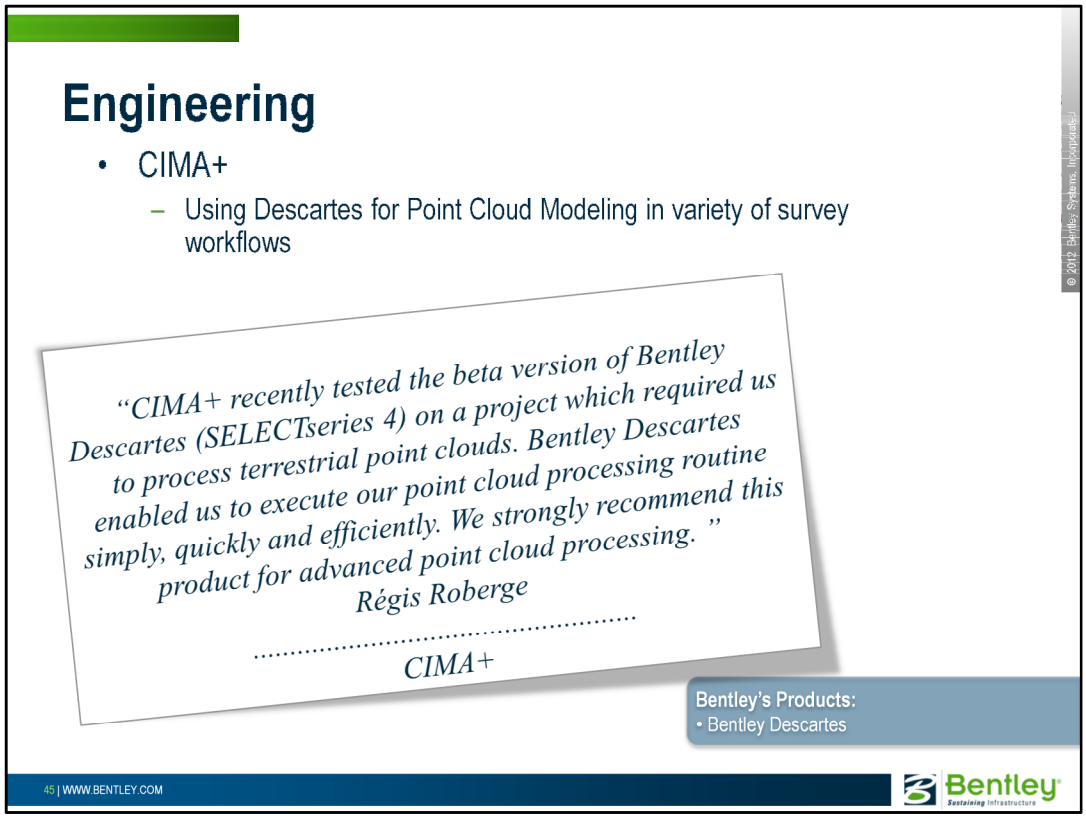


3d engineering : by using the 3d urban model, they can have engineering tasks performed. For example, if a side walk needs to be elevated for a renovation project, using 3d allows them to validate that no window will be obfuscated, have begun to capture more 3D water data for a future migration to a full 3D dataset. Oracle data is currently in 2D, but had attributes that provides the elevation data (z)



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Wrap-up

- Point clouds are viewable in most Bentley desktop products
- Bentley Descartes is the tool for advanced point cloud workflows
- Bentley Descartes also adds tools for fast display of very large digital elevation models and draped imagery
- Bentley Descartes works directly with most Bentley desktop software.(OpenPlant, AECOSIM Building Designer, InRoads…)

Image Processing | Hybrid Raster/Vector | 3D Modeling | Terrain Modeling | Point Cloud Processing