Bentley
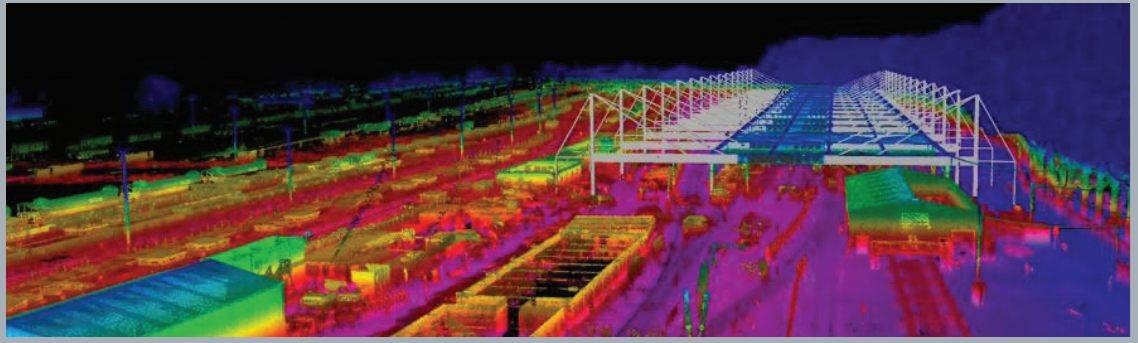*Advancing* Infrastructure

CONNECT Edition

Bentley Pointools
Powerful and Fast Pre-processing of Point Clouds

Bentley Pointools CONNECT Edition supports the viewing, animation, and editing of point clouds in stand-alone workflows, enabling the intuitive cleanup and preparation of point clouds to make them easier to reuse in downstream applications. Users can streamline scan-to-model workflows by importing point clouds from all major scanner manufacturers.

The CONNECT Edition
The SELECT® CONNECT Edition includes SELECT CONNECT*services*, new Azure-based services that provide comprehensive **mobility** and **collaboration** benefits to every Bentley application subscriber. *Personal Mobility Services* provides unlimited access to Bentley apps, ensuring users have access to the right project information when and where they need it. *ProjectWise® Connection Services* allow users to securely share application and project information, to manage and resolve issues, and to create, send, and receive transmittals, submittals, and RFIs.

Fast Point-cloud Engine
Bentley Pointools is powered by Pointools Vortex, the industry's leading point-cloud engine, which enables the support of very large point clouds. Users can work on huge datasets with billions of points, manage scene parameters interactively, and rapidly load and unload native format point-cloud POD models. The software uses real-time, high-performance streaming to provide incredible display performance while visually maximizing point-cloud density, clarity, and detail.

Improved Visualization
Point clouds can be visualized with a range of fully blendable shading options enabling easier visual interpretation on the fly and production of enhanced imagery or movie content. The 3D brush enables the coloring of the point cloud, which is ideal for color correction, detailed highlighting, or visual mock-up, while layer colors can be used for per-layer colorization with controllable opacity. Bentley Pointools provides confident identification of clashes between objects, enabling dynamic tests for clashes along a pre-defined movement path or as objects are repositioned. Bentley Pointools also quickly and easily identifies how an asset has changed over time through point-cloud differencing.

Support for Multiple Object Types
With Bentley Pointools, users can easily import and view three types of objects:

- Point clouds, which can be imported from a large range of scanners.
- Textured 3D models, which can be imported from a number of common model formats.
- 2D CAD drawings, which can be imported from DXF, DWG, and SHP file formats.

Bentley Pointools also provides the ability to use Pointools POD files with all MicroStation-based applications, eliminating the need for time-consuming data conversion.
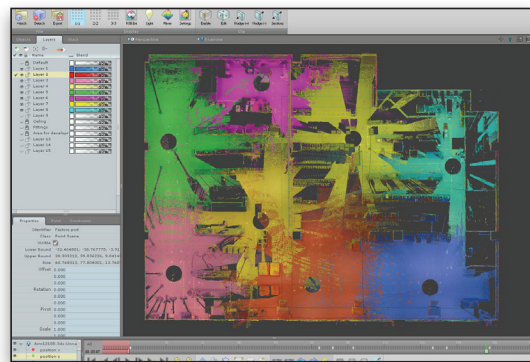
Use up to 128 layers; lock, rename, save, and delete layers easily. Utilize LAS classifications and create layers from clouds.

Layer-based Editing and Segmentation
Bentley Pointools features unique point layer technology for unrivaled point-cloud editing speed. Move points between one of 128 layers to isolate particular areas for detailed editing, making it easier for users to manipulate, clean up, or segment the point-cloud model to enable enhanced understanding and easier reuse.

Point layers can also be used to visualize and edit point-cloud classification and also support scan-by-scan editing workflows. All editing operations are saved in an editing stack, which can be manipulated, saved, reloaded, and applied to a different dataset, compressing editing workflows.

Bentley Pointools offers two measurement tools: point information (or single point) and point-to-point. Notes can also be attached to objects within the workspace, providing a convenient way to annotate a scene. Both coded measurements and notes can be exported as a text or HTML file.

High-quality Deliverables
With Bentley Pointools, users can generate professional-quality images, animations, and movies. Users can produce high-resolution orthographic and perspective images, by rendering snapshots of any size, limited only by their computers'graphics hardware and available memory. Users also have the flexibility to set the image size and scale, while benefiting from the choice to output rulers, scale, and positioning for accurate reuse.

Bentley Pointools also provides an intuitive timeline-based fly-through and object animation system for users to quickly and easily produce movies. Anti-aliased rendering and motion blur enable users to generate high-quality animations with little or no aliasing and moiré. A graph editor, full object transformation control, and scripting provide advanced animation capabilities.

Bentley Pointools At-A-Glance

Object Import
- Point-cloud import from: ASCII, Pointools v1.0-1.1 POD, Terrascan BIN, LAS, LAZ, e57, Leica PTX and PTS, Faro FLS and FLW, Riegl 3DD, RPX, RDB and RSP, Optech IXF, Topcon CL3, and DeltaSphere 3000 RTPI
- 3D model import from: 3DStudio 3DS, Lightwave LWO, Wavefront OBJ
- Drawing import from: AutoCAD DXF and DWG, Esri shapefile

Project File Management
- Stores current project settings, layers, saved views, tool states, and animation setup
- Auto-save

Interface and Navigation
- Dockable menus
- Object Tree manager
- Navigation modes: zoom, pan, free, examine, explore, and light direction
- 3D Connexion mouse support
- Walk mode navigation using arrow keys

General Visualization
- Display settings: frame rate, overall and object bounding box, axis, grid, refresh methods, and camera transition
- Environment settings: backdrop types and lighting
- Stereo anaglyph, interlaced or generic quad-buffered display
- Saved Views manager

Point-cloud Visualization
- Cloud and layer shading
- RGB (color) and intensity shading: intensity contrast and brightness control, and point lighting with material quality control
- Plane shading: distance, offset, axis, fit to data, and edge
- Dynamic LOD control
- Clipbox (to isolate area of interest)

3D Model Visualization
- Shaders: cel-shaded, outline (pen-line like effect), and lighting
- 3D model display: render as points if needed, lighting, texturing, cel-shade, outline, double sided, cull back face, and Z-order transparency

Drawing Visualization
- Anti-aliased display
- Per layer visibility control

Notes
- Attachment of documents, images, movies, and other multimedia content to geographic locations
- Notes management in folders
- Display styles: color, box style, font type, style, and size
- Display options: depth cue, show full note, show coordinates, collapse notes with distance, and position on viewport edge
- Hyperlink support: Internet URL, file, saved views, animation frame, play animation, and run script

Point-cloud Differencing and Clash Detection
- Static and dynamic clash detection between objects
- Detailed in-viewport clash region display
- Point-cloud differencing

Point Editing
- 2D point selection: rectangle, polygon fence, and plane
- 3D point selection: cube brush, sphere brush, and point cloud from point
- Selection operations: select all, deselect all, and invert
- Selection constraints: by color, intensity, and greyscale
- Point visibility operations: hide selected, unhide all, and invert visibility
- Support for up to 128 point layers
- Layer operations: add, remove, hide, show, switch layer mode (single or multi-layer), apply random layer colors, reset, setup LAS layer, point cloud per layer, layers from classification, layers from selected classification, and move points to layer
- Layer manager
- RGB painting: direct application via brush tools and layer-wide operations via layer filter
- RGB color selector: current color, extract color from viewport, swatch (colors storing), color selector (based on hue, saturation, luminance), color channel slider, transparency, and nine blending modes
- Color application using sphere or cuboid brush
- Active layer filters: erase paint operations, fill points, reset RGB editing, brightness/contrast, hue/saturation, and white balance
- Stack-based editing (stores point-related operations and previous editing operations can be applied to other data)

Object Manipulation
- Two in-viewport rotating and movement modes: Axis Arrow and Rotate rings

- Local or world transform mode (keep object's own coordinate system or apply model coordinate system)
- Pick tool (click any object from viewport to select it)
- Large object reference

Measurement Tools
- Point measure (single point position)
- Distance measure (point-to-point distance)
- Measure log options: save to delimited ASCII file, clear, display settings (color, coordinate and distance units, and precision), and tag (code applied to next measurement)

Rendering Snapshots
- Size options: image dimension and scale, output file size, and calculate print size
- Selection of area of interest
- Info options (for orthographic projection): minor and major ruler markings, or as grid, scale text, datum line, title, camera position and direction, and add logo or image
- Output options: anti-aliasing level and file format (TIFF, JPG, EPIX)

Stereoscopic Viewing
- Viewing via anaglyph glasses, auto-stereoscopic screens, or any quad-buffer-based stereo device
- Display options: depth control and amount (of depth effect), and swap left/right cameras

Animations and Movies
- Animation wizard (fly-through, orbit)
- Timeline user interface, with animation controller/parameters and keying mode
- Panning and zooming of the timeline
- Undo/redo timeline operations
- Animation options: scale animation and camera path import/export
- Animation of 3D objects, camera, clip box, light, and settings
- Object and camera transformation parenting
- Object and camera motion scripting
- Graph editor: fine tuning of keyframe position, key value editing, and interpolation methods (stepped, linear, Catmull-Rom spline, and TCB spline)
- Control of timeline settings
- Image sequence, AVI, or MOV movie output
- Stereo left and right output
- Tiled output

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