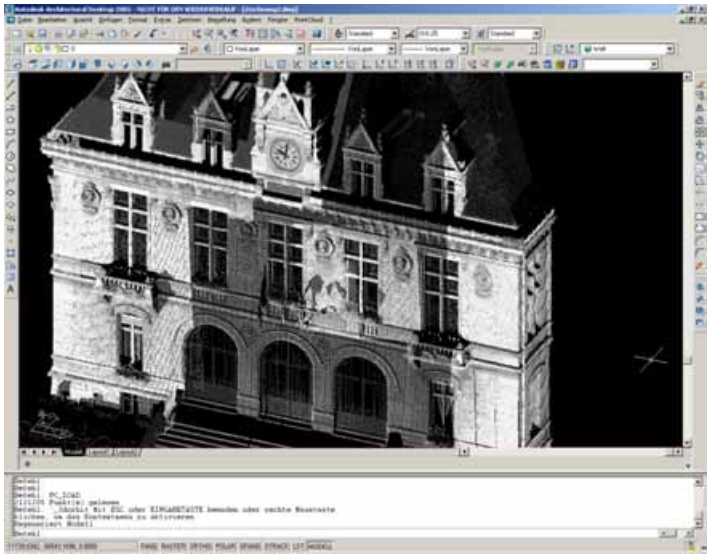
Technical Information about PointCloud

The following pages may give you a detailed overview of the possibilities using PointCloud. For further questions or comments please do not hesitate to contact us or one of our local resellers.

kubit GmbH
Altplauen 19, 01187 Dresden, Germany
Fon +49 351 41767-0 Fax +49351 41767-29
Email info@kubit.de Web www.kubit.de

kubit USA
P.O. Box 7680
Houston, TX 77270, USA
phone (toll free) 1-866-kubitUSA
phone (local) +1-713-864-7106
e-mail info@kubitUSA.com
website www.kubitUSA.com

Q1 What is PointCloud?



PointCloud is an AutoCAD application for visualizing and working with 3D point clouds. The documentation of historical buildings and monuments, industrial plants and others can be done with the expected level of detail. Even other documents (e.g. images, floor plans or other CAD elements) can be combined with the point cloud to be processed.
Millions of points captured with a 3D laser scanner can be used efficiently where all modelling tools are sufficiently present – in AutoCAD. Using the AutoCAD functionality "Object Snap", the user has access to every single point and its 3D coordinates. Therefore all AutoCAD commands – and also the functionality of third-party applications – know about the exact geometry of the scanned object.

Q2 What kind of AutoCAD versions does PointCloud support?

AutoCAD 2004/2005/2006/2007/2008 and all vertical AutoCAD applications such as Architectural Desktop, AutoCAD Map, Civil 3D etc. are supported.

Q3 What types of 3D laser scanners are supported?

The import of point clouds into AutoCAD becomes much easier with the PointCloud PTC file format. Meanwhile **nearly all common scanner types** provide export to PTC files. If no PTC export is possible the scanned data can be imported into PointCloud by using an ASCII file.

Currently optimized interfaces are provided for the following **scanner systems**:

- FaroScene (FARO)
- Ilris3D-Parser (Optech)

- LaserControl (Zoller&Frölich and Leica HDS4500/6000)
- Polyworks (Inovmetric)
- Reconstructor (JRC/Topotek)
- RealWorlsSurvey (Trimble)
- RiScanPro (Riegl LMS)

Q4 What image data can be used in PointCloud?

The PointCloud Pro version additionally provides functionality to post-process 3D information of point clouds together with high resolution information of images. For this purpose PointCloud offers special import functionalities. Orthophotos that have been created using RealWorks Survey (Trimble), Reconstructor (JRC/Topotek) or RiScanPro (Riegl LMS) can be imported directly at the correct position in the drawing. Oriented images (scanposimages, undistorted images) created in RiScanPro (Riegl LMS) or Reconstructor (JRC/Topotek) can also be imported directly into PointCloud Pro.

Q5 How are the point clouds saved?

Every (ASCII)-import leads to a PTC file for the corresponding point cloud. Compared to the ASCII format, the PTC file is handling the point cloud in a very compact manner. In addition, such an PTC file can be loaded faster then a simple ASCII file because the points are already arranged in a way, that necessary points are displayed immediately. The points are automatically sorted in the 3D space. To allow this, a special functionality called Octree is applied (recursive division of a 3D space in 8 parts with the same size).
The PTC file is referenced in the AutoCAD drawing like it is done with images. Accordingly the size of the drawing is NOT increased essentially.

Q6 How can the point clouds be organized?

Different parts of a point cloud (e.g. a single tube) can be coloured, displayed or hidden. A manager for visible sectors allows a convenient organisation of the point cloud for someone's own perceptions.

This, for instance, can be very useful when modelling special parts of the scanned object inside AutoCAD and all other information (i.e. points) are not of interest. The visible parts can be defined as a box, slice or even as free polygons.

Once a clash detection with an AutoCAD solid was carried out, the overlapping parts are also listed as a visible sector and can be managed like this.

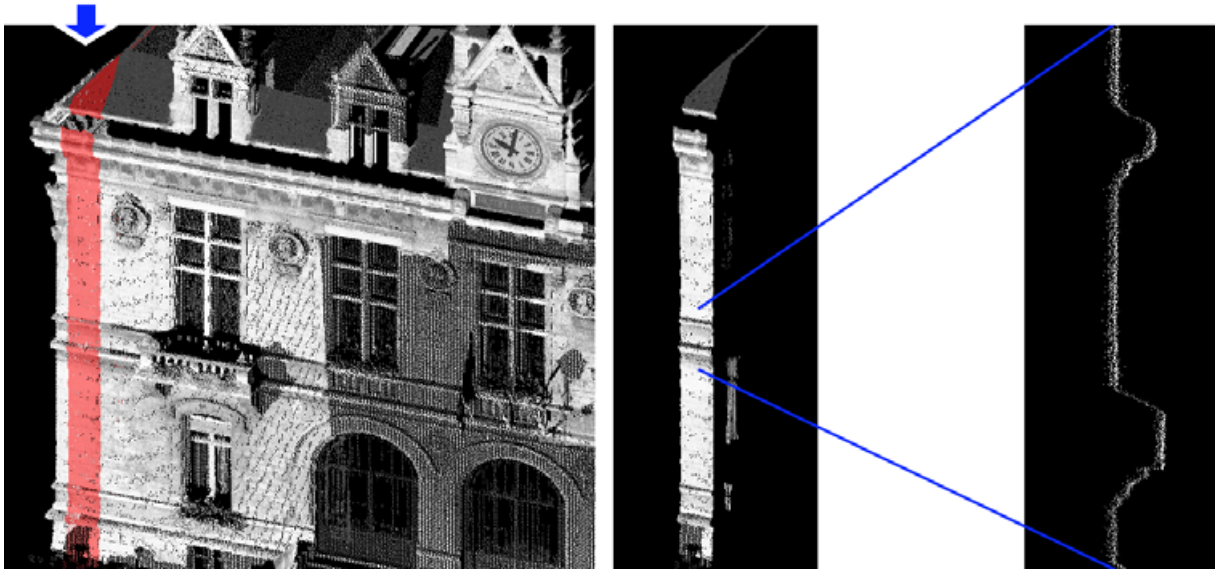


Illustration 1 Definition of a visible sector (in this case as a vertical slice); Hiding all other points; Vectorisation of a contour line.

Q7 Why is PointCloud this fast?

The most important reason for the high performance is very simple. Only those points are displayed which are actually visible. This very easy and effective principle needs a sophisticated computing behind since the software has to determine which points have to be displayed. This way it is possible to display only the number of points the display is consisting of. This is a maximum number of 0.7 million points (1024x768) even if the point cloud has 30 million points.

Due to this, PointCloud is always showing the points with the correct draw order. Points which are situated in the background (behind other points) are

not displayed. So it is easier for the operator to understand and to work with the cloud.

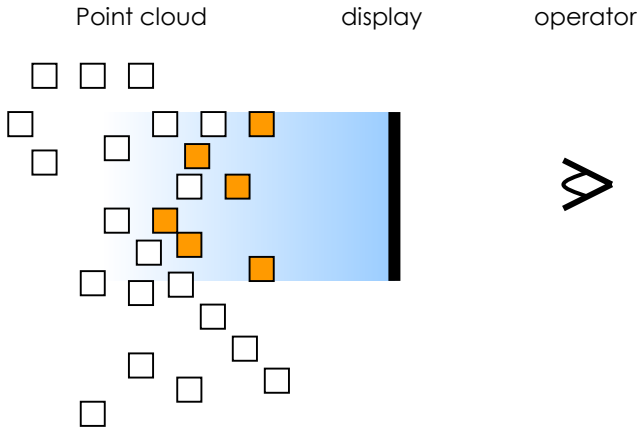


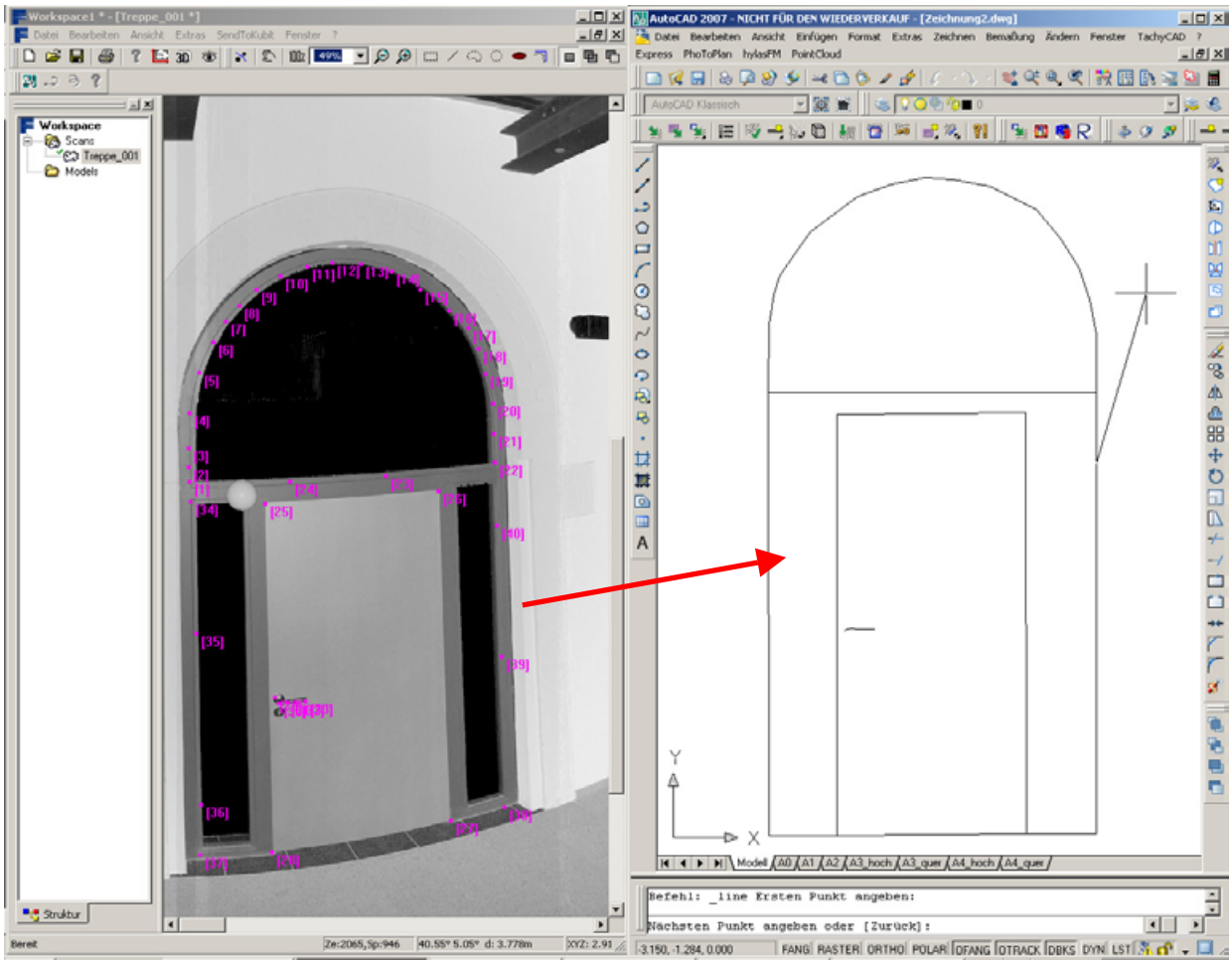
Illustration 2 Only the points in the front (dark points) are visible for the operator and are drawn from PointCloud. While zooming, panning or applying the 3D orbit, the visible set of points is changing.

Compared to usual AutoCAD points, the points within PointCloud are very 'light-weighted'. AutoCAD points are holding additional information like layer name, point style etc. Data in PointCloud does not have all of these information in order to save storage space and to increase performance. Even though the point cloud is a single AutoCAD element (custom entity), the user has access to every single point of the point cloud. The object snap 'point' is supported and so a common processing of the data (drawing polylines, dimensioning etc.) can be done.

While applying the 3D orbit, the point cloud is thinned out for a fast rotating and navigating.

Q8 Which advantages offers the 'SendToKubit' function?

The current version of PointCloud contains a library (SendToKubit) which allows external programs to send coordinates to AutoCAD/PointCloud for any command, that expects a coordinate as input (polyline, spline, but also copy, rotate etc). A typical application is the digitizing of point clouds directly in the viewer software like it is provided by many scanner manufacturers.



For digitizing the better display of a point cloud in an application especially developed for point clouds is used (left). At the same time 'SendToKubit' allows the usage of all AutoCAD commands for processing (right).

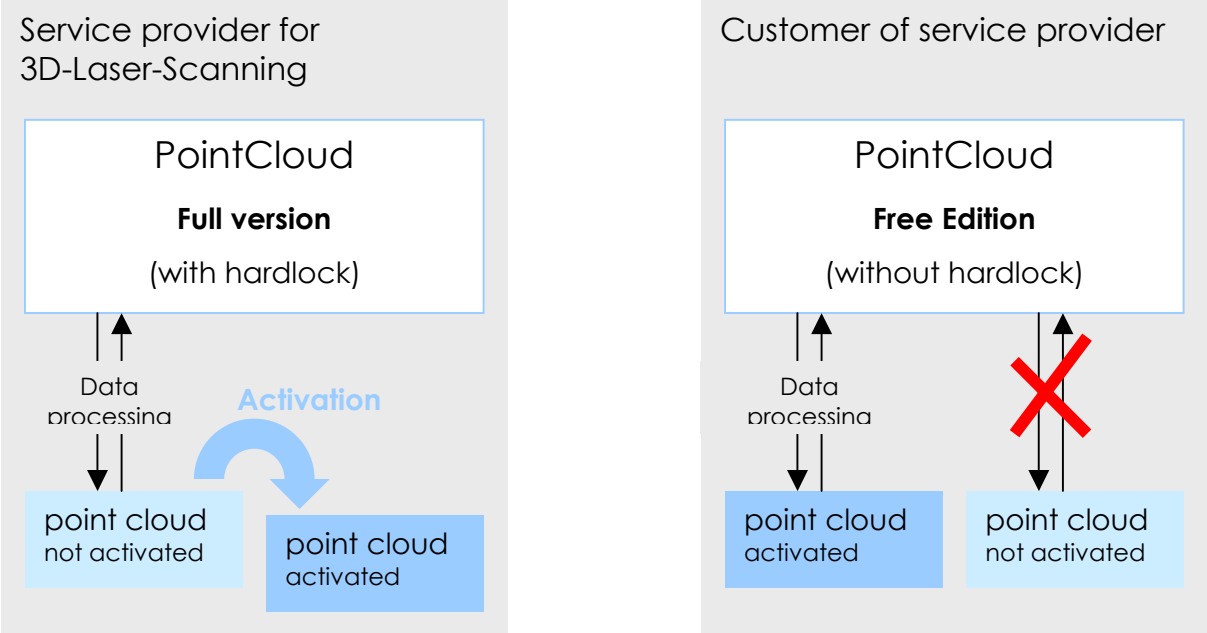
'SendToKubit' is currently provided for the following **software systems**:

- FaroScene (FARO)
- LaserControl (Zoller+Fröhlich + Leica HDS4500/6000)
- Reconstructor (JRC/Topotek)

Q9 What is the secret of the PointCloud *Free Edition* ?

The 'Pay-Per-Use' concept offered by kubit was developed on the request of some of our customers who are service providers and wish to forward the data captured (point clouds) to their customers for further analysis and processing.

Concept: Together with the data acquired a full function PointCloud version is supplied to the final customer, copies can be made from the original CD or can be downloaded from the kubit website, no licence is required for the PointCloud *Free Edition*. PointCloud is then activated for a limited set of data, but without any limitation regarding performance or functionality.

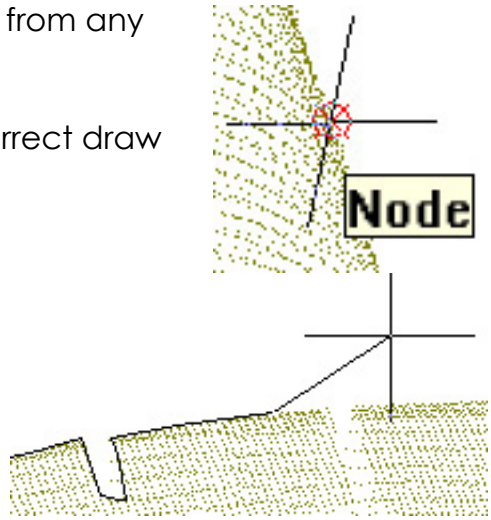


The PointCloud *Free Edition* allows an easy transfer and usage of point cloud data.

One PointCloud licence already includes keys for the activation of 10 datasets. This allows a quick return of invest of PointCloud for our customers. If additional activations are needed the user can request them comfortably by using the activation wizard.

Q10 What kind of functionality is supported PointCloud and the Pro version?

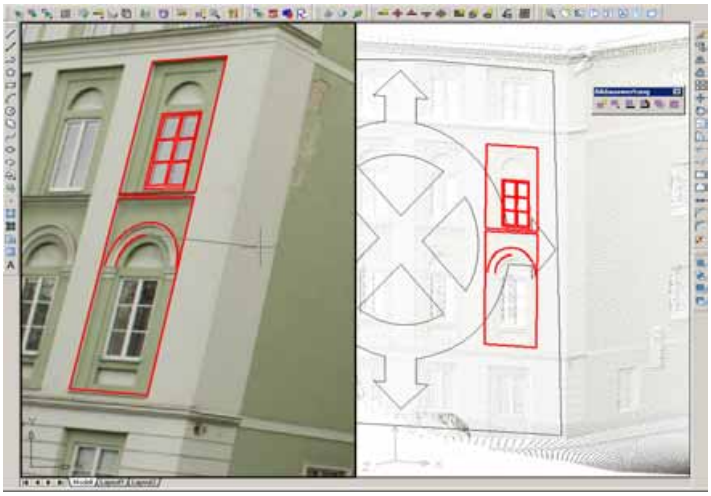
- Import of (true-coloured) point clouds from any type of scanner.
- Displaying all necessary points with correct draw order and best resolution.
- Supporting the AutoCAD object snap 'Node' (see illustration).



- Organisation of the point cloud data using the sections manager.
- Definition of single sections of a point cloud
- Multy section command for simultaneous creation of many sections (e.g. each 2m a 10cm thick section parallel to the XZ plane)
- Switching visible sections on and off or giving them different colours.

Point Cloud Pro offers the following additional functionality

- Clash detection with AutoCAD solids.
- Fitting of plane to point clouds with restrictions like 'perpendicular to XY plane' and different drawing possibilities with those planes
- Import of orthophotos and oriented images
- Simultaneous post-processing of orthophotos (plane information on a high resolution) and point clouds (detailed information in the depth).



Combined processing of oriented image (left) with point cloud and plane fitted to that point cloud (right)

Q11 How can I try out PointCloud?

PointCloud and all of its functionality can be fully tested using the free demo version. Different point cloud data sets are included in the download. In addition, the user is able to test his own data, too. To do so, please contact kubit or visit the kubit website for more information (contact details are listed on the first page of this documentation).