

# Point cloud data processing: softwares and steps

## Registration

### Cyclone 360

1. importation of scans and reference points in a .txt file
2. Once you have a good cloud-to-cloud connection with links among the clouds, right-click on the bundle > apply control points (the cloud will be anchored to the control points)
3. Registration
4. Exportation in different formats with pdf report of the process

## Cloud cleaning

### Cyclone

The cleaning operation can be performed before the registration.

### CloudCompare

It's an open-source helpful software also for point cloud analyses - online tutorials are available. The cleaning activity can be operated with the SEGMENT command: it creates a selection through polylines, and you can choose to remove the points inside or outside of your selection (icons with polygon and red areas that you find on the command bar). You can create more polylines and work through more cleaning steps. At the end of the cleaning process, you need to confirm the result.

You can reduce the number of points to make the cloud lighter. SUBSAMPLE command: it allows you to choose between criteria for deletion (avoid random setting). You can also decide the minimum space you want between the points in the three-dimensional space.

N.B. After the segmentation and subsampling, the software will create a new point cloud. You can then save it by selecting the point cloud that you want to save.

## ReCap Pro version by Autodesk

1. Create a new project.
2. Upload the point cloud or download the point cloud from Leica BLK scanner.
3. Index the scan(s).

You can clean and reduce the space between points to make your point cloud lighter. You can also export the cloud in other formats or export images of your project in image formats.

## Drawing and modelling

### Autocad by Autodesk

Autocad (and also Revit) opens point clouds in .rcp format that can be created in Cyclone; otherwise, if you have another file format, you can upload it on ReCap and create the .rcp format through it.

In Autocad: attach your point cloud (pay attention, don't scale it!). The point cloud is treated as an object, so you have to select it to apply for changes and get its properties. Selecting your point cloud, you can create planes for sections (choosing the orientation of the plane). Also, planes are treated as objects: select them to get their properties. For example, you can transform a plane into a slice and decide the thickness of the slice. This helps in drawing 2D plans and sections.

N.B. Planes/Slices appear with a grey colour that can make cloud visualization difficult. You can select the plane, go to its properties and set 100% transparency.

To draw 2D plans and sections, it is recommended to work on Layout. Set up the model-environment visualization in the space, and you are ready to draw on it without mistakes due to different quotes of the points in the point cloud sections you create.

N.B. You can create as many slices/planes as you need. A good practice is to classify the planes in layers dedicated to horizontal and vertical planes.

If you save the Autocad project, you will maintain the point cloud reference: when you open the project again, the cloud will be automatically linked.

### Rhinoceros

You can import point cloud in Rhino without a plugin (in e.57 formats for example), but there is more crash risk. This is the reason to use a plugin. We suggest the **Point Cloud for Rhino** plugin by Veesus. You can download it from Veesus website or from Food for Rhino website. To work with the plugin, you need a Veesus Zapcha business account.

N.B. You also need to download **VPC Creator** from Veesus website (this is gratis) in order to convert the point cloud in .vpc format.

These are the steps to follow:

1. Account Veesus-Zappcha (7 days Pro version trial):

2. <https://www.veesus.com/subscriptions/>
3. Download Rhino trial version (90 days)
3. Download Rhino Point Cloud PlugIn:  
<https://www.food4rhino.com/en/app/point-clouds-rhino> (you need a business account or ask a trial version)
4. **Install PlugIn:**  
[https://www.veesus.com/downloads/quick\\_start/Rhino\\_QuickStart.pdf](https://www.veesus.com/downloads/quick_start/Rhino_QuickStart.pdf)
5. Download VPC creator: <https://www.veesus.com/vpc-creator/> (free)
6. Download **Arena 4D** if you want for visualization and video (free)

You open the point cloud in .vpc format (green icon on the left corner of the plugin window).

You can create slices in the SLICE bar inside the plugin window. Before creating the slice, select the viewport according to which you want to create the section plane. Activate the perspective visualization of the slice in order to see it live in the perspective viewport. You can move your slice by selecting it in the other perpendicular viewport.

With the plugin, you can find two possibilities for automatic line drawing on your slices. This can be done with two commands in the lower bar of the plugin window:

- VECTOR > will create polylines according to an algorithm, flanking or in the middle of the points of the slice
- OUTLINE > will create two polylines around the points of your slice

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Links:

<https://www.youtube.com/watch?v=RTsMlcnFN-0>

<https://www.youtube.com/watch?v=KtCMCjwQkhc> (point cloud in Rhino without PlugIn)

<https://discourse.mcneel.com/t/how-to-draw-in-a-locked-plane/14559/3> how to draw on a plane on Rhino to build 3D modelling

# Photogrammetry

## Metashape

1. Add photos (photos with different focal lengths will be divided into different chunks. Chunks can be merged later with the cloud-to-cloud method if the pictures are taken with at least 60% overlap)
2. Select the photos, right-click, and choose Estimate the photos' quality. Disable or remove pictures with quality below 0.5
3. Align photos and get the tie points (don't worry about resolution; this are only the points to link the point clouds that will be created later)
4. Calibrate cameras
5. Gradual selection: reduce tie points
6. Detect markers (automatic recognition in the Tool window)
7. Insert control points (upload .txt. file) and check markers names to anchor them

8. Batch process: (set saving after each step!!! + Set your computer to never go to sleep mode!!) Select Dense Cloud >> Mesh >> Texture (set the parameters you need)
9. Orthomosaic: to create vertical images according to your markers (you can set new markers if needed)
10. Export: you can export the point cloud to work with 3D, or export the orthomosaic as image

N.B. Save along each step!!

Link:

<https://www.agisoft.com/downloads/user-manuals/>

[https://www.agisoft.com/pdf/metashape-pro\\_2\\_0\\_en.pdf](https://www.agisoft.com/pdf/metashape-pro_2_0_en.pdf) (Pro version)