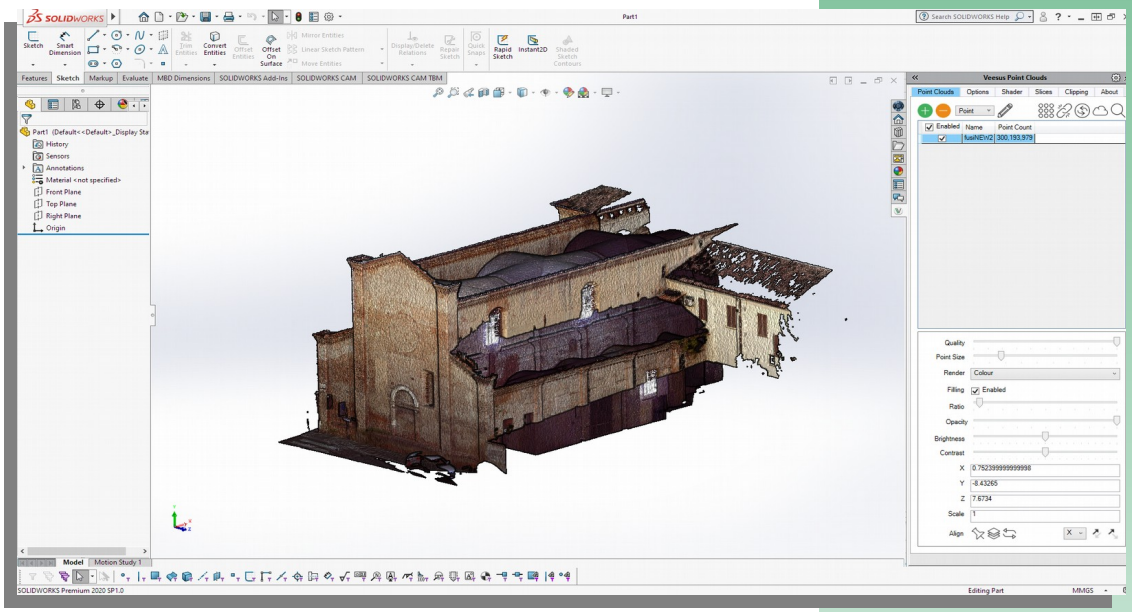
Veesus Arena4D For SolidWorks

User Guide



Software Version 2020.2.7

Oct 2020

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1 Introduction

1.1 About

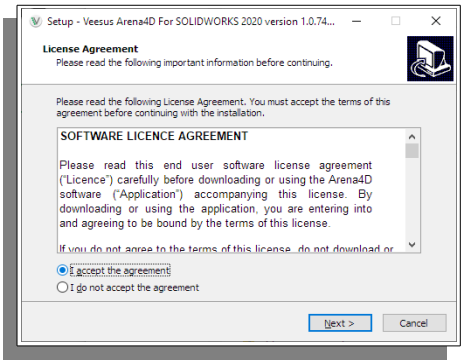
Welcome to the User Guide for the Veesus Ltd Point Cloud Plugin for SolidWorks.

At the core is a point rendering engine that allows the rapid loading and visualisation of unlimited point cloud data sets.

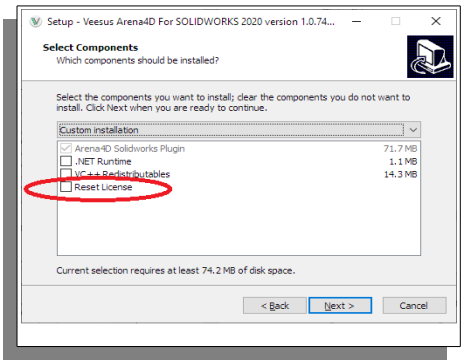
This engine is the same as used in all Veesus products including the fully featured stand-alone Arena4D Data Studio product from Veesus Ltd.

1.2 Installing Arena4D Plugin for SolidWorks

Arena4D for SolidWorks installs as an add-in through the SolidWorks architecture. To do this first run the Setup Wizard and follow all the steps during the installation process.

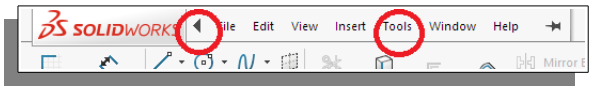


If a demo licence has been installed before and replacement full licence is to be installed at this stage select "**Reset Licence**". Under no other circumstances select this option. *If in doubt contact Veesus support and install without option selected.*

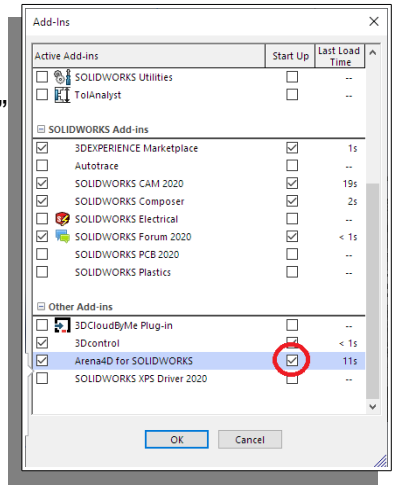


Once finished:

- Load SolidWorks
- From the "**Tools**" menu select "**Add Ins ...**"



- Make sure "**Arena4D for SoildWorks**" has both "**Active**" and "**Start Up**" selected:



1.3 Data Formats

Arena4D for SolidWorks requires point cloud data to be in the Veesus VPC format. To generate a VPC file you need to use the standalone **VPC Creator** which can be download for free from the Veesus website.

1.4 Loading & Saving

All Arena4D options are saved into the SolidWorks document. However the point cloud is saved as a reference, therefore if you move or delete the VPC file after saving the document it will not be loaded the next time you open and an on screen notification received.

1.5 Centre Pivot Point Control

When manipulating around a point cloud (especially when large in scale) it is useful to centre the pivot point for accurate rotation of the camera in a perspective view. To do so double click the left mouse button on on the required centre pivot point whilst holding the '**Shift**' key.

2 General Work Flow

Once point cloud(s) are loaded into the Arena4D add-in the following steps might form part of a general workflow:

- Orientate the point cloud. Section: 3.3.2 Align
- Set the point cloud Origin. Section: 3.3.1 Origin
- *Professional version only: Clean the point cloud (delete)*
- Perform a Shader for quick inspection of elevation changes. Section: 3.7 Shader
- Perform Slices and Clipping. Section: 3.5 Slices and 3.6 Clipping

3 User Interface

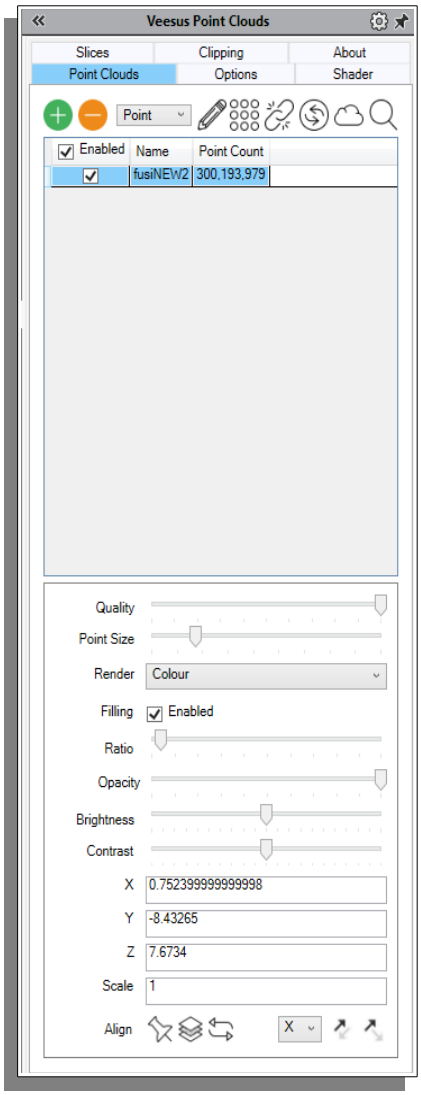
3.1 General

The Arena4D user interface is very simple and consists of a number of control tabs which separate the key functional parts of Arena4D into separate sections.

In each section there will be three common buttons.

The "**+**" button adds an item to the current list, "**-**" button removes.

3.2 Point Clouds



When a point cloud is added and selected in the displayed list, a number of options become available which control the appearance of that point cloud. **Note:point cloud must be selected for the following features to work:**

Quality – determines the density of the rendered point cloud. The higher the quality the better the appearance, but the slower the performance.

Point Size – The size of points.

Render – Draw using Intensity, Colour or Ramp values.

Filing – Fills gaps in the point cloud data by intelligently sampling the point data. *Only use with **perspective** camera*.

Ratio – Controls the power of the filling setting for distance.

Opacity – The transparency of the selected point cloud(s).

Brightness – The brightness of the selected point cloud(s).

Contrast – The contrast of the selected point cloud(s).

Drawing Tool –  Choose a Point, Line or Splice, select  and drawings will snap to the cloud point.

Zoom –  button centres the SolidWorks views on the currently selected point cloud(s).

 **Restore –** button restores point cloud deletions.

 **Clash Detection –** detect clash between point clouds and meshed surfaces see: 3.8 Clash Detection

 **Convert Clashes** – clashes are converted to native SolidWorks points

Server – button see section:  4 Arena4D Point Server

X, Y, Z – Position of each axis

Scale – Adjust the displayed size of the selected point cloud(s). Can be scaled up or down.

Align – Tools used to manipulate the point cloud(s) position and rotation see: 3.3 Align

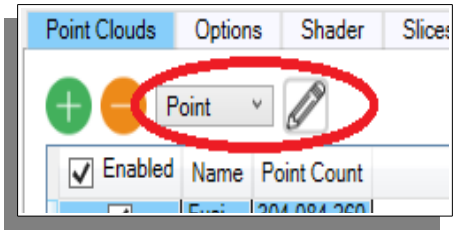
3.3 Align

Tools used to position and rotate selected point cloud(s) within SoildWorks.

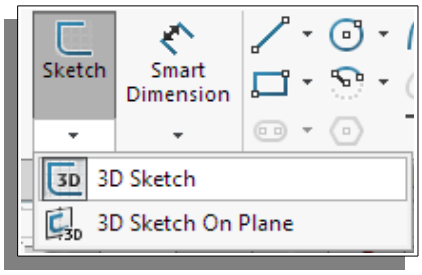
Note: the use of Arena4D drawing tools 

with *Origin* and *Align* gives accurate point selection with the Arena4D point clouds.

3.3.1 Origin

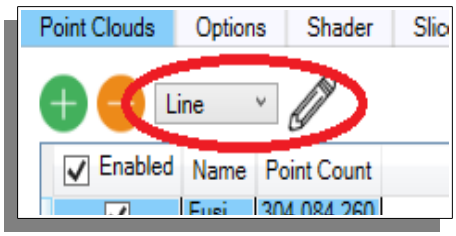


Position a "**Point**" on the selected point cloud (if point snapping is required ensuring **Point** is selected from the Point Clouds menu followed by highlighting the **Add** icon). Select newly created point highlighting it blue and select the **Origin** icon. The point cloud will be moved to X,Y,Z 0,0,0 centred on the selected point.



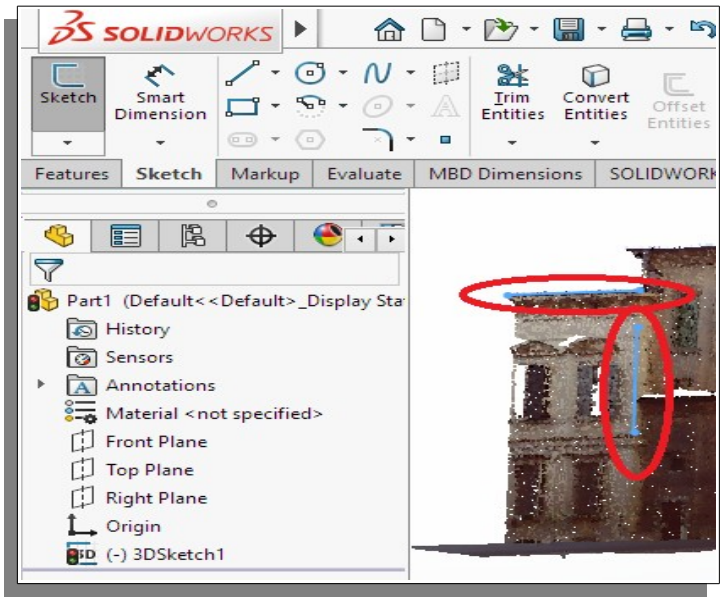
Note: make sure a SoildWorks "3D Sketch" has been added before using Arena4D "Add" icon.

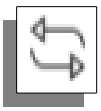
3.3.2 Align



Draw two new axis "**Lines**", one representing **X** and the other **Y** on the selected point cloud. If snapping to the point cloud is required ensure **Line** is selected from the Point Clouds menu followed by highlighting the **Add** icon (Pen). Select both lines (**horizontal first**) highlighting them blue and select the **Align** icon. The point cloud will transition relative to the new axis.

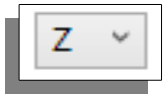
Note: use Axis, Flip and Rotate to correct the orientation.





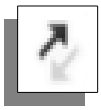
3.3.3 Reset

Resets any of the align or origin operations back to the point cloud(s) original loaded location/rotation.



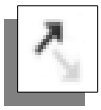
3.3.4 Axis

Select which axis **Flip** and **Rotate** are applied to **X**,**Y** or **Z**.



3.3.5 Flip

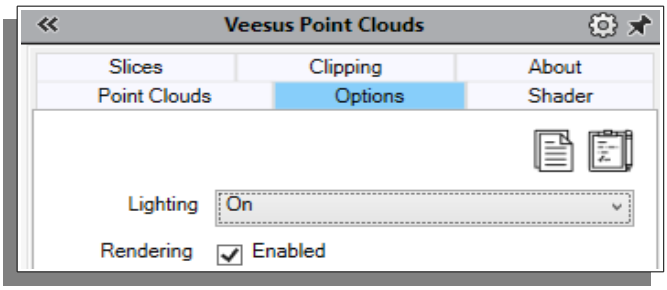
180° flip selected point cloud(s) around selected **axis**.



3.3.6 Rotate

90° flip selected point cloud(s) around selected **axis**.

3.4 Options



The options panel features settings that affect all point clouds.

Lighting – Adds dynamic lighting to the scene with the light source behind the current eye position.

Rendering – Removes VPC point cloud(s) from the view displays.

Copy – copies the Veesus Point Clouds and properties (slices, clips, alignment, origin etc.).

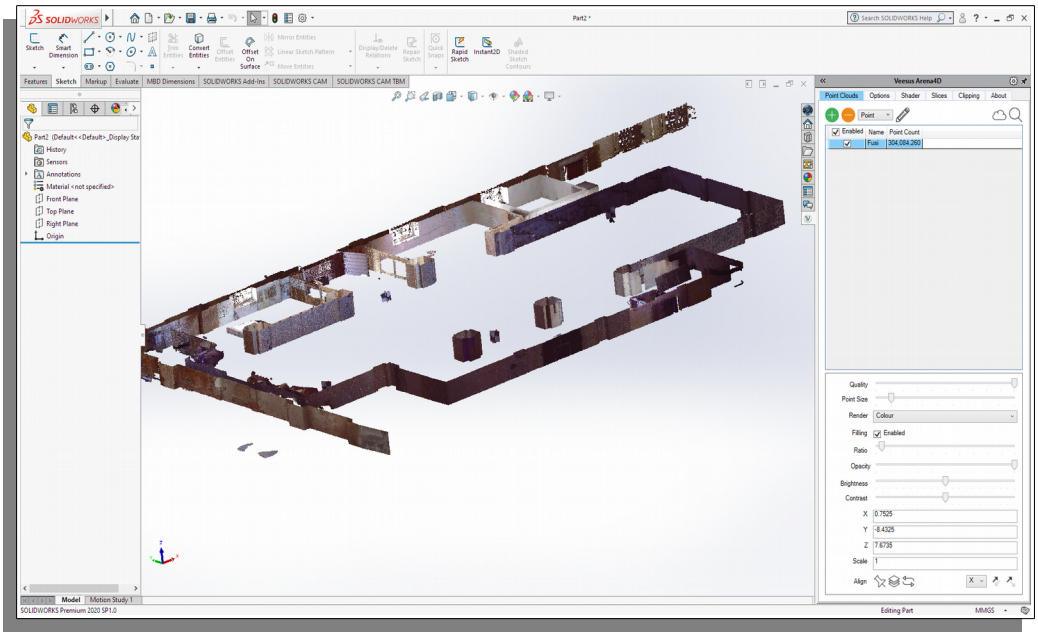
Paste – pastes the contents of the Copy above into a new SolidWorks Part or Assembly.

Note: perform the Copy then select or generate a new Part or Assembly before selecting Paste.

3.5 Slices

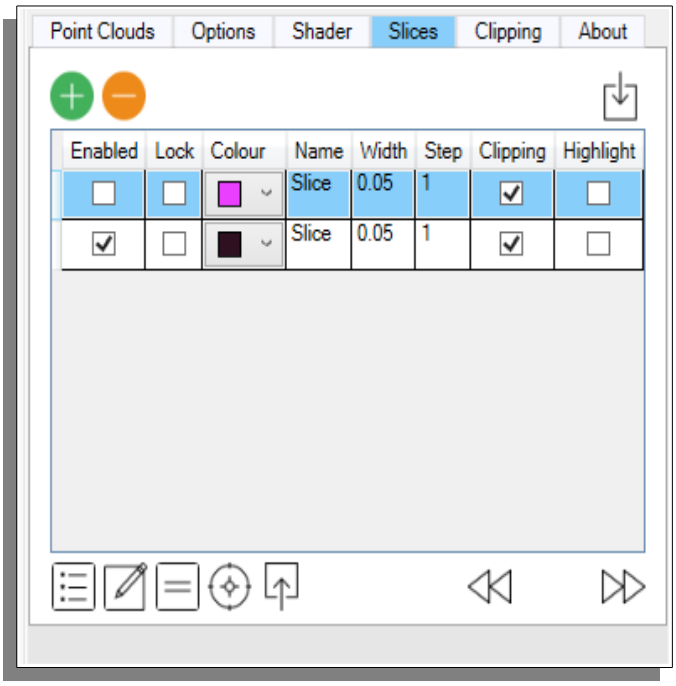
Slices are a way to quickly visualise a section through the point cloud(s).

The slice is visualised in the viewing window as a usable definable sized cut.



The slice can be moved by stepping through users defined distances. Section: 3.5.7 Step Slice.

It is not possible to have multiple slices active at any one time.



Each slice has the following properties:

Enabled – Turn slice on/off.

Lock - prevent slice from being moved.

Colour - select individual colour.

Name - meaningful names can be applied.

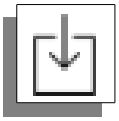
Width - in units of current document.

Step – the amount of slice movement. See 3.5.7 Step Slice

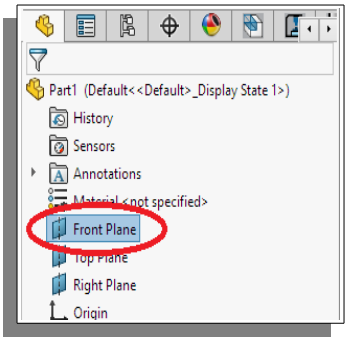
Clipping - effect the selected points within clipping.

Highlight - whether the slice is highlighted at all times.

At the top of the slice window:



3.5.1 Slice From Plane

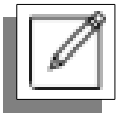


Slices through the point cloud at the position of the selected plane from the SoildWorks "**FeatureManager Design Tree**" tab. Created slice added to the Arena4D plugin slices tab.

At the bottom of the slice window are seven buttons:
Professional Version only in blue:

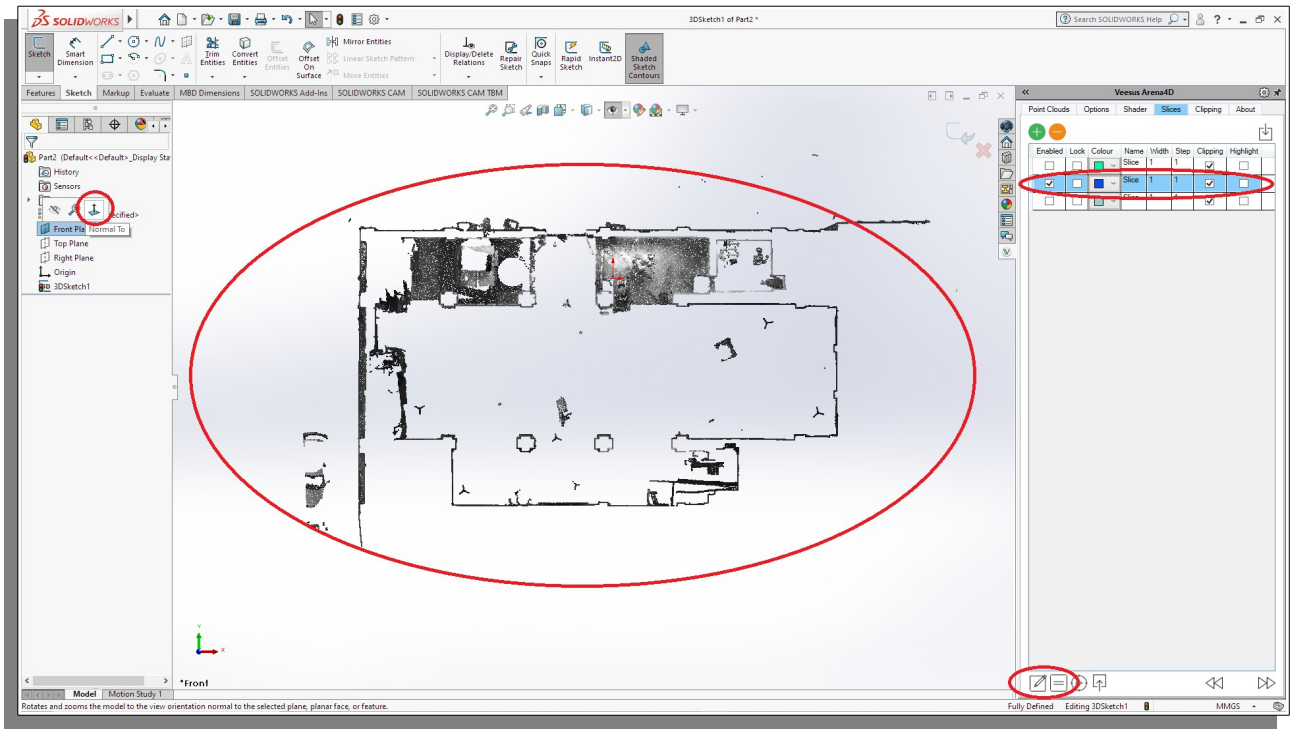
3.5.2 CSV (Plane Analysis)

Creates a text based CSV (Comma Separated Values) file containing X,Y,Z - R,G,B – Intensity - Classifications – Distance (from centre of slice outwards in both directions).

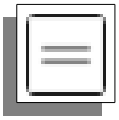


3.5.3 Vector

With a slice positioned as required within the point cloud data, position the view full screen where possible and squared to the slice, select Vector.



The resulting drawings will be centred around the middle of the sliced data.

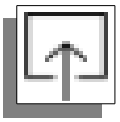


3.5.4 Outline

As per Vector section 3.5.3 Vector, but the resulting drawings will be an outline of the point cloud data within the sliced..

3.5.5 Position Slice

Click directly where to position the slice within the active slice.



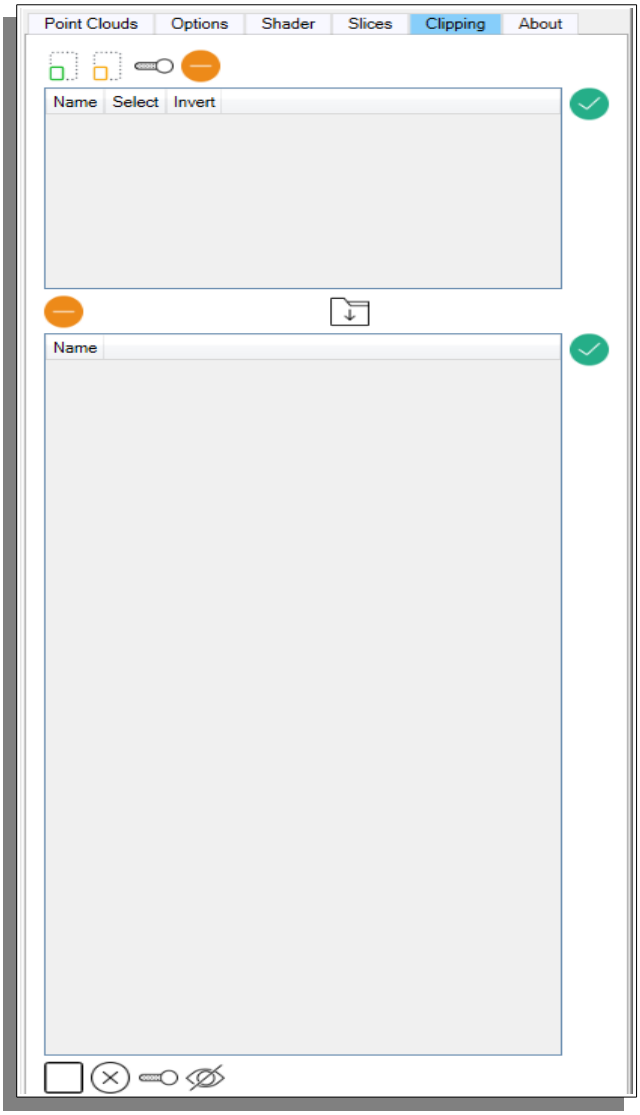
3.5.6 Plane From Slice

Generates a SolidWorks plane from the currently selected Arena4D plugin slices.

3.5.7 Step Slice

The left and right buttons step the currently selected slice by it's current step setting.

3.6 Clipping



The clipping tab is used to select areas of point data that you wish to hide or unhide.

The four main controls of the Clipping tools are *Select*, *Unselect*, *Invert* and *Remove* as represented by these icons:

Select activates the clip tool in the current active window. Use the left mouse button to add points to the clip polyline and the right mouse button to end the selection.

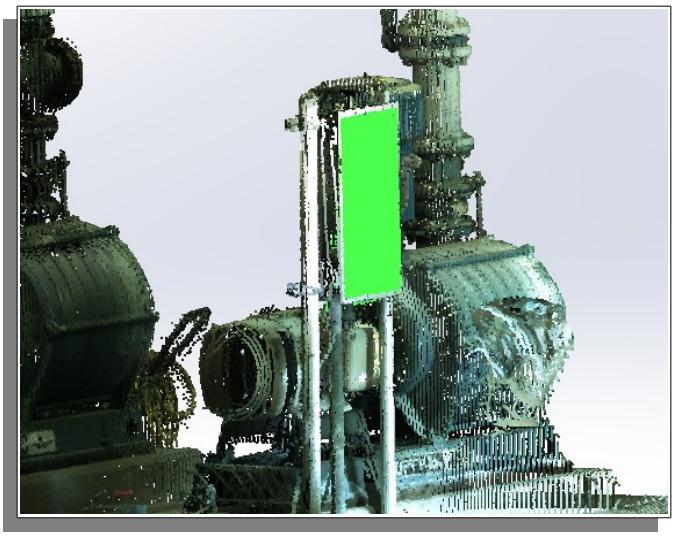
All data within the polyline will be selected.

Unselect works in the same way but unselects everything within the polyline.

Invert toggles the effect of the select and unselect tool. Instead of selecting everything within the polyline they will select everything outside the polyline.

Once data is selected it will turn green in the main viewing window.

Remove selected clips



At the bottom left of the clipping panel are seven buttons.

Select All selects all the points in the currently enabled point cloud(s).

Clear unselects all the points in the currently enabled point cloud(s).

Invert inverts the current selection.

Hide will make selected points become invisible/visible.

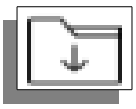
Professional Version only in blue:

Delete selected points from the point cloud (use clips to select the area).

Note: to restore the point cloud back to how it was original created with the VPC Creator see section Error: Reference source not found Error: Reference source not found "***Restore***".

Copy selected points (use clips to select the area) to a new Veesus Point Cloud (VPC). File name will be request.

Plane Through Points adds the currently active clip to the planes.



As well as creating individual clips you can group a series of clips into a clip group. For example you may have taken a number of selections to isolate a chair in a room. You can select all these clips and create one single clip group by pressing the create clip group button.

Individual clips or clip groups can be applied at any time by either double clicking them in the list, or clicking the process button opposite the table.

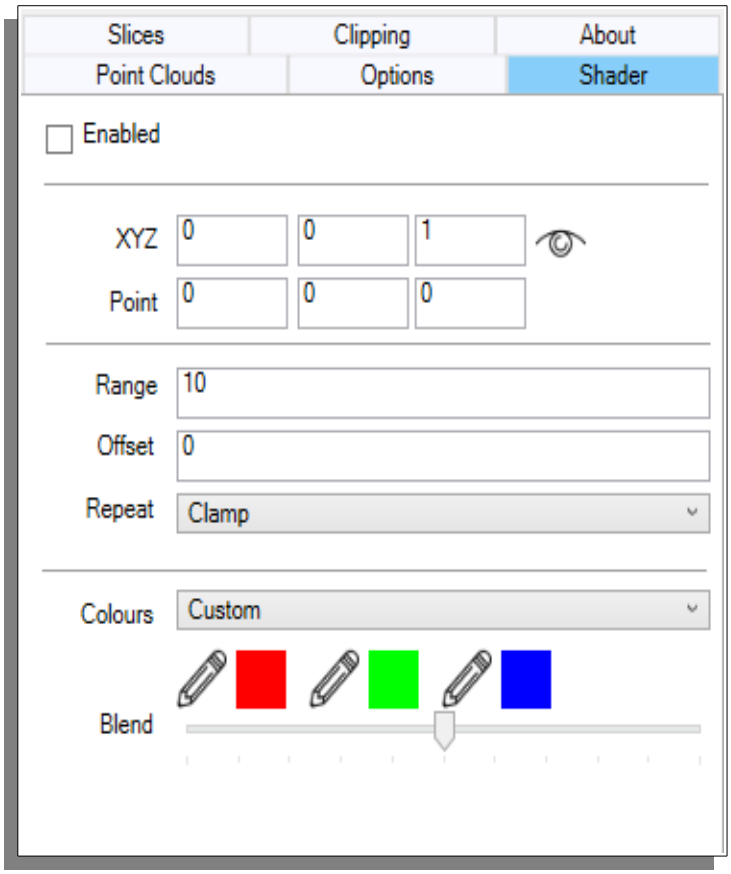
Delete Selected deletes all individually selected clip(s) and in the group section deletes all individually clip group(s). **Note: Does NOT unselect all the points in the currently enabled point clouds. For this to happen select the Clear button**.

3.6.1 Clipping In Slices

If an active slice and its "***Clipping***" tick box is turned on whilst performing a clip operation, only data within that slice will be effected.

For example a slice could be cutting through the floor of a room, meaning only the floor is visible. Creating a new clip whilst this slice is active will ensure only data from the floor is selected.

3.7 Shader

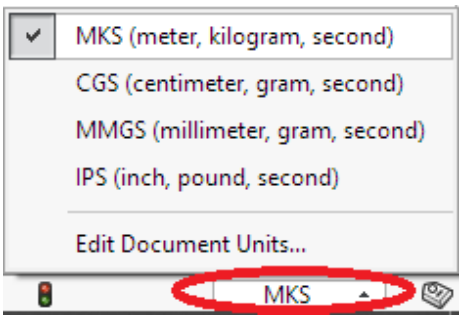


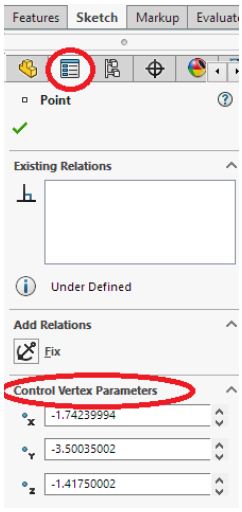
The shader panel provides control over the planar shader. This is a capability which colours data along a plane or vector from a given position or offset.

Once enabled you can change the shaders direction by changing the XYZ values of the normal vector. XYZ should add up to '**1**' if the point cloud is aligned to the planes, 1 being placed in the plane direction required.. If your point cloud is not true to the planes plane then values of 0.054,-0.041,0.998 for example may provide a the alignment (yours will be different).

A simpler option is to align the shader to the view direction. Pressing the eye icon will set the XYZ values for you and set the shader "**zero**" point to be your current view position.

Point – Useful for positioning the start point of the shader. Use the **Add Point** option (select a point on the point cloud as per section: 3.3.1 Origin, do not click align) to position a point directly at the start position. Once selected under SolidWorks "**PropertyManager**" copy X,Y,Z values displayed into the Arena4D Point fields. Arena4D works in **Meters** which can be selected in SolidWorks to make this process easier.





Range – The distance over which the shader will calculate values.

Offset – The distance from the shader zero point to start calculating from. Useful for moving the shader along the axis.

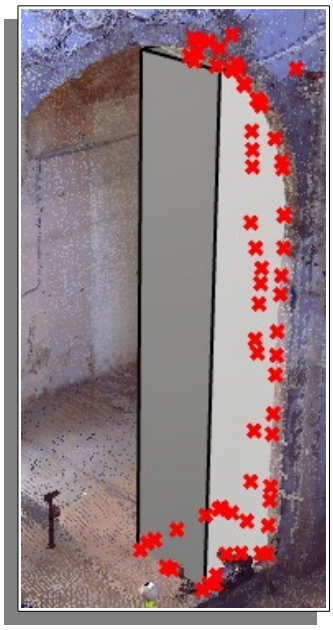
Repeat – How the shader should act once it has gone beyond either the start or end location as calculated by Range + Offset:

- *Clamp, continue with first/last colour.*
- *Stop, don't apply colours beyond range.*
- *Repeat, loop through colours again.*

Colours – You can chose between your own custom colour palette in the shader, or to use the entire RGB hue values.

Blend – Effect of shader on point colours.

3.8 Clash Detection



When Point Clouds and Meshed Surfaces come into contact, the clashed areas will be highlighted with a red cross.

Turning the Clash icon on/off will display or remove clashed arears.

Note: visual performance will be reduced with clash enabled.

3.9 Point Cloud not displayed correctly

There are conditions that may stop a point cloud being displayed:

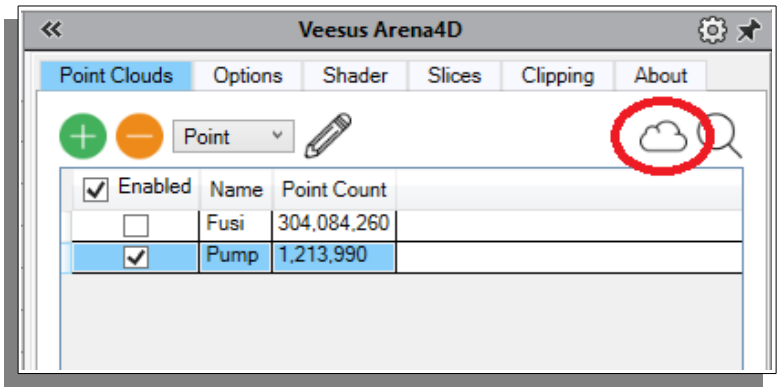
- Arena4D Data Studio is capable of generating “protected” VPC files. These disable export functions and optionally add an expiry date to the data. Once the expiry date has passed you will no longer be able to view the data.

  If your point cloud data is not visible, check with the VPC provider whether they protected and enforced an expiry data on the files you were provided.

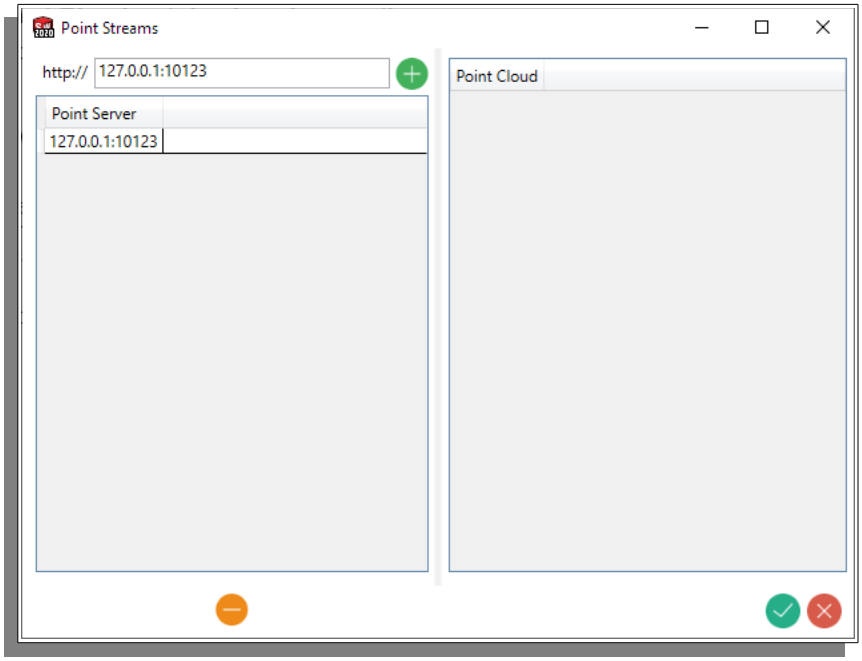
4 Arena4D Point Server

For owners of or permitted access Arena4D Point Server(s) you can stream data to Arena4D for SoildWorks.

To access to Arena4D Servers first select the Point Cloud tab.



Clicking the **Open Point Stream** button will launch the **Point Server Manager**



To add a new server enter the URL of the server including the port number, then click the **Add** button.

For example *127.0.0.1:10123*

Once the server is added it will appear in the list of available servers.

Selecting a server will produce a list of point clouds on that server in the right hand side. Once a point cloud is selected from the server simply click **Open** to start streaming that data to your viewer.

Streamed point clouds can be manipulated in anyway a normal point cloud file can be.