



Software Installation Guide

Instructions for software configuration and operation



Notes

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Information that supplements or clarifies text.



A caution that actions, operation or configuration may lead to incorrect or improper use of the hardware/software.



A warning that actions, operation, or configuration may result in regulatory noncompliance, safety issues or equipment damage.

Italics

Italics are used for unique terminology and part numbers, and for emphasis.

Options_> Data

This notation is used for user interface controls and navigation.

`/data/dd_mm_yy_XXX`

This font is used for file and directory names, terminal interface input/output, and output in the text section of the main user interface window.

Revision History

Revision	Date	Description	Prepared by	Reviewed by
1.0	19 th Sept '21	Installation, licencing and data capture	KK	JH
2.0	1 st Feb '22	Updated references and minor edits	JH	LL

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Part 1 – Overview

Scope

GeoSLAM Connect is a software platform to work alongside the ZEB family of scanners. Using the world's leading SLAM algorithm (GeoSLAM Beam) alongside 3D visualisation of data, additional processing and filtering, workflow automation tools and integration into third party software applications. With the push of a button, data can be automatically processed, saved in a pre-designated folder of choice, and prepared for the next step of the user's workflow. Behind its simple interface are customisable workflow scripts that tell GeoSLAM Connect how to process data.

The software is made up of the GeoSLAM Viewer. GeoSLAM Connect Viewer is designed to run the specified workflows and view the resulting processed data.

Part 2 – Software Installation of this guide covers installation and licensing of the software package. *Reference Topics* including the Program Interface are provided in **Part 3 – Program Interface** and *How-To Topics* are provided in **Part 4 – User Workflows**. Background information concerning the concepts used in the software are provided in **Part 5 – Technical Background**.

Further help and information

In the event of a problem that cannot be resolved using the information supplied, please contact GeoSLAM. You can also gain assistance through the support page on our website: <https://geoslam.com/support/>

For further assistance, contact the GeoSLAM Technical Support team by telephone or email. Our Customer Support personnel will discuss your situation, determine the cause of problem and provide the appropriate technical assistance.

Contact GeoSLAM by any of the following methods:

- Phone: +44 (0) 1157 270740 (all countries)
- Phone: +1-833-444-7907 (US & Canada)
- Email: support@geoslam.com

Part 2 - Software Installation

Software required

Software Package	Current Version
GeoSLAM Note APK	0.3
GeoSLAM Connect Viewer	2.0.0
GeoSLAM Licence Manager	0.0.4

Table 1 – Software required.



GeoSLAM Connect is protected using Flexera software-based copy protection and licensing. A single licence key is provided with each copy unless further seats or licenses are purchased. The licence key can either be activated directly via the internet or using a manual activation for offline computers.

Once the application installer has been selected and the default settings accepted, the option to create a Super Administrator will be available (Figure 1). These credentials are currently saved to the local machine so they cannot be transferred from one PC to another. These login details will be the same for the GeoSLAM Connect Viewer.

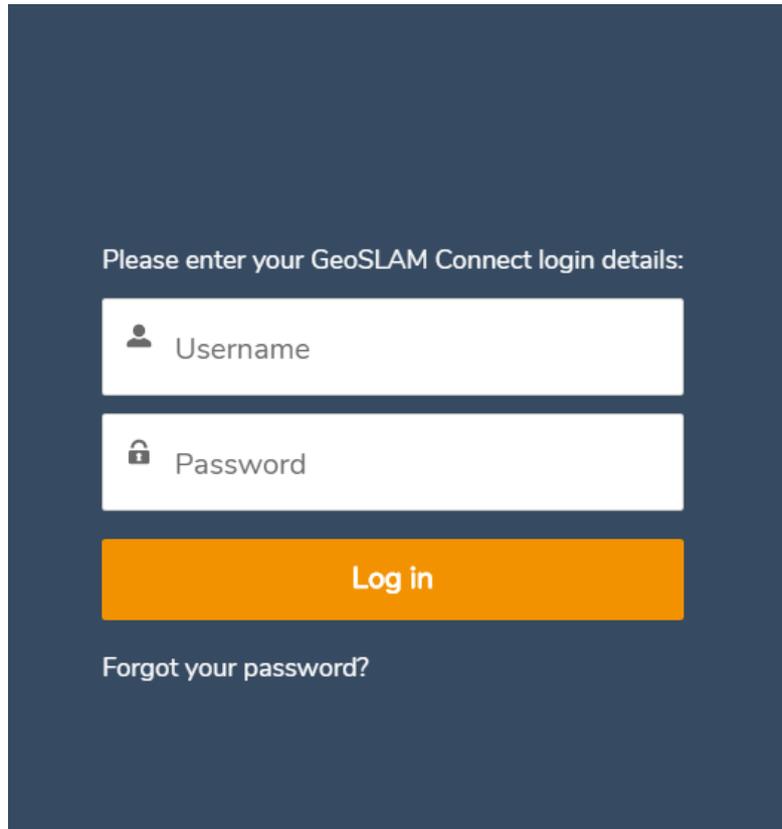
System requirements

System Requirements	
Minimum	Recommended
Windows 10	Windows 10
i7 6th Generation	i7, i9 8th generation or greater (higher clock speed)
AMD Ryzen 7 (1700X)	AMD Ryzen 7 (2700X)
Integrated Graphics	NVIDIA GTX 1060
16GB RAM	32GB RAM
30GB free space	30GB free space
SSD	SSD

Table 2 – System requirements.

Software installation and configuration

Sign in



Please enter your GeoSLAM Connect login details:

Username

Password

Log in

[Forgot your password?](#)

Figure 1 – My GeoSLAM login.

After installation, the user will be able to open Connect via either the Desktop shortcut or from the windows search bar. You can now login using My GeoSLAM, which is a web portal access to the GeoSLAM Connect software. My GeoSLAM allows you to login for 30 days continuously and has the ability for users to reset their password.

Logout

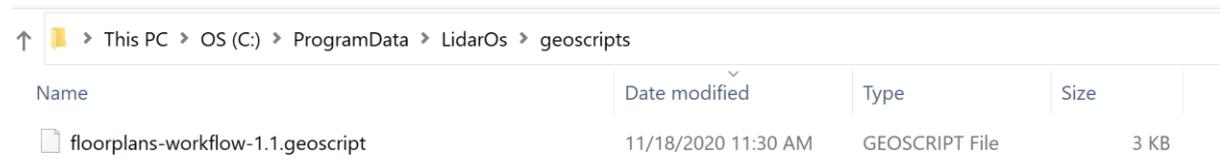
The  icon in the top-right corner allows the user to log out of the Connect Viewer.

Adding Geoscripts

Geoscripts are the scripted workflows that have been designed to automate processing and simplify tasks for the user.

The geoscripts required to perform workflows in GeoSLAM Connect are downloaded during installation and can be found in the folder *C:\ProgramData\LidarOs\geoscripts*. Any future

geoscripts will need to be copied to this location and can then be selected from the Connect Viewer interface when importing data.



Name	Date modified	Type	Size
floorplans-workflow-1.1.geoscript	11/18/2020 11:30 AM	GEOSCRIPT File	3 KB

Figure 2 - Location of Geoscripts.

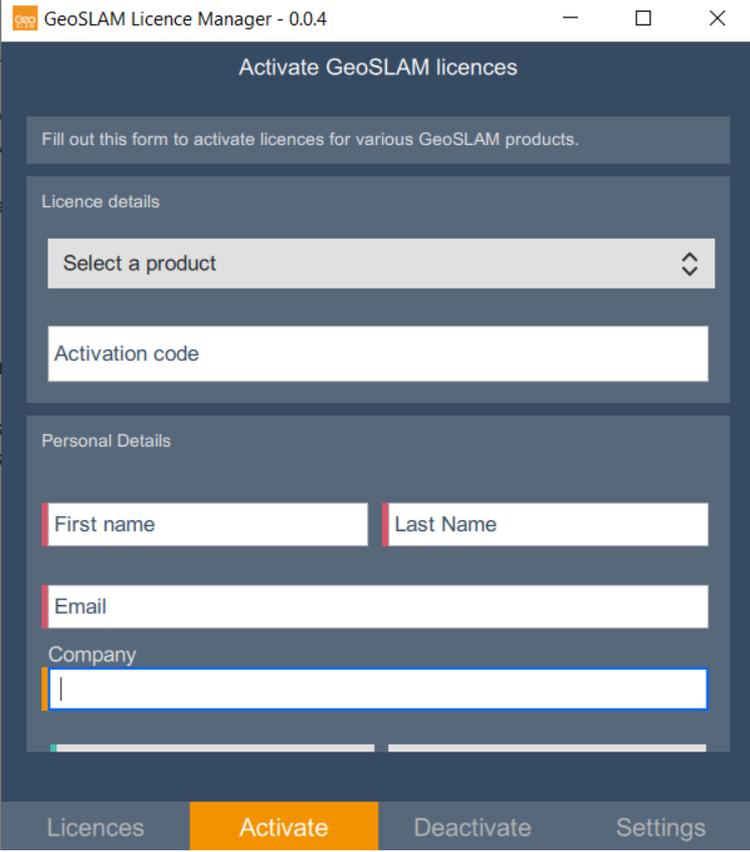
Data folder structure

The data outputs and project folders will be created within the LidarOs folder structure located in *C:\ProgramData\LidarOs*.

License activation

To activate a licence, search for the GeoSLAM License Manager using the windows search bar (Figure 3). A GeoSLAM Connect Licence can be activated either online, or for environments without an internet connection – offline (a user requires two PCs, one with an internet connection for offline activation).

A 32-character **Activation ID** is required to licence Connect features.



The screenshot shows the 'GeoSLAM Licence Manager - 0.0.4' window. The title bar includes standard window controls (minimize, maximize, close). The main content area is titled 'Activate GeoSLAM licences' and contains the following elements:

- A header instruction: 'Fill out this form to activate licences for various GeoSLAM products.'
- A section titled 'Licence details' containing:
 - A dropdown menu labeled 'Select a product'.
 - A text input field labeled 'Activation code'.
- A section titled 'Personal Details' containing:
 - Two text input fields for 'First name' and 'Last Name'.
 - A text input field for 'Email'.
 - A text input field for 'Company'.
- A bottom navigation bar with four tabs: 'Licences', 'Activate' (highlighted in orange), 'Deactivate', and 'Settings'.

Figure 3 - GeoSLAM Licence Manager main window.

When opened, the program will determine if a valid software license is available and display all active licences on the 'Licences' tab. The feature, version and start and end dates are available to view at any time, giving the user the ability to check their licence's validity. The table can be refreshed at any time, allowing the user to confirm licence activation.

Online Activation

This process is only applicable for PCs with an internet connection. This connection can be a temporary connection to communicate with the licensing database. Once the licence has been activated, the software does not need to maintain this connection and the internet connection can be disabled.

To complete the Online Activation:

1. *Select* -> GeoSLAM Connect
2. *Input* -> **Activation ID** -> the activation code provided with the system.
3. *Input* -> User information (Name, Company, Email Address)
4. *Select* -> **Activate**, to begin the activation process.

Offline Activation

To undertake an offline activation, the user must have access to both the PC running the *Connect* software and a second PC that must have an internet connection.

To activate the licence, the user must create a *Capability Request* file. This file must be manually transferred from the *offline* PC to an internet-enabled PC, which will then create a *Capability Response* using a web-based portal. After this, the *Capability Response* file must be transferred back from the internet enabled PC to the *offline* PC.

1. *Select* -> **Offline Activation** tab (Figure 4).
2. *Input* -> **Activation ID** -> the activation code provided with the system.
4. *Select* -> **Create File**, to create the *Capability Request* file. This will open the Create License Activation Request File dialog (Figure 5).
5. *Browse* -> save location.
6. *Select* -> **Save**, to continue.
7. The process will create 2 files. The *Capability Request* file plus a text file containing a link to the Flexera Network Operations (FNO) website.
8. Manually, copy the *Capability Request* file from the offline PC to the PC with internet connection.

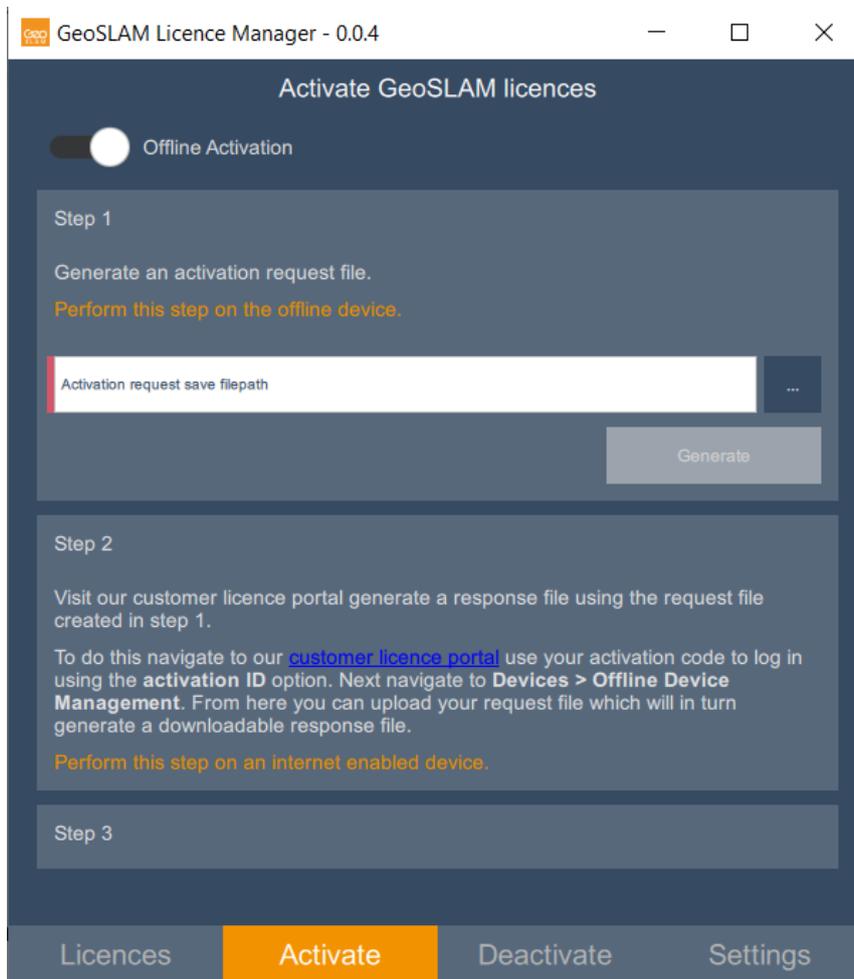


Figure 4 - Offline activation tab within GeoSLAM Licence Manager Tool.

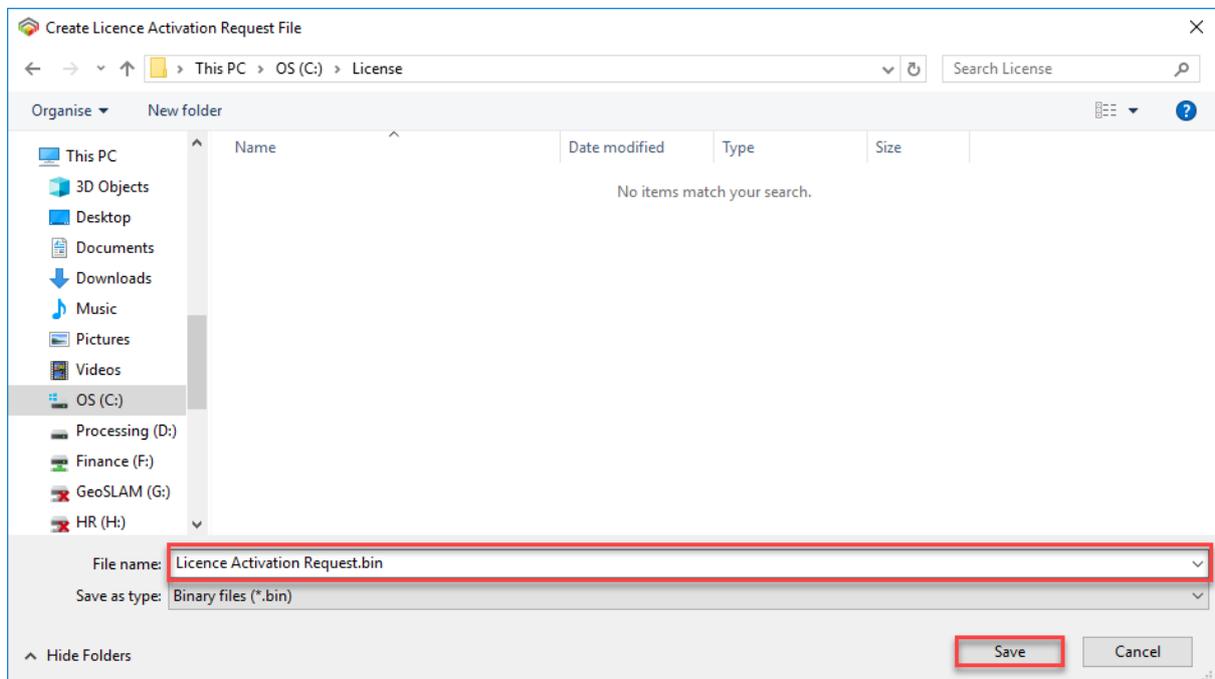


Figure 5 - Creating a Licence Activation Request.bin file.

9. From an internet enabled computer, open an internet browser.
10. Copy and paste the *FNO* login screen address from the text file to display the log in dialog (Figure 6).
11. At the log-in screen, *Select* -> **Activation ID**.
12. *Input* -> **Activation ID**, provided with the system.
13. *Select* -> Log in, to continue.

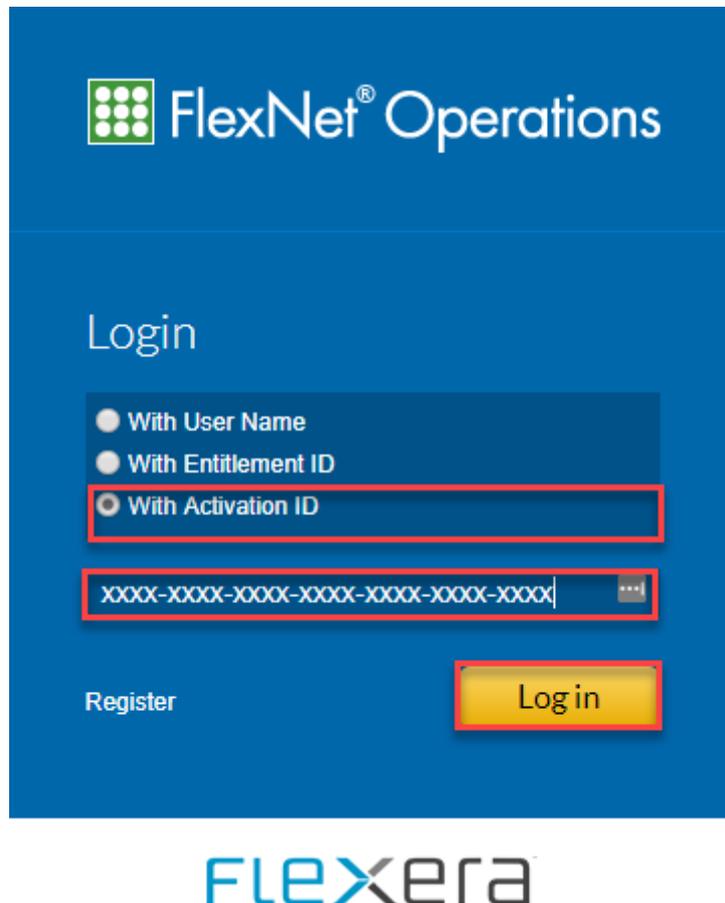


Figure 6 - FlexNet Operations screen, select login with Activation ID, and enter your 32 character licence as shown

14. If the log in process is successful, this will open the License and Delivery Portal (Figure 7).
15. *Select* -> **Devices** -> **Offline Device Management** (Figure 8).
16. This will open the **Offline Data Management** screen (Figure 9).
 - a. *Select* -> Generate License.
 - b. *Select* -> **Choose File** and browse to the location of the *Capability Request* file.
 - c. *Select* -> **Upload** to continue.
17. The system will offer the user the ability to download a *Capability Response* file.

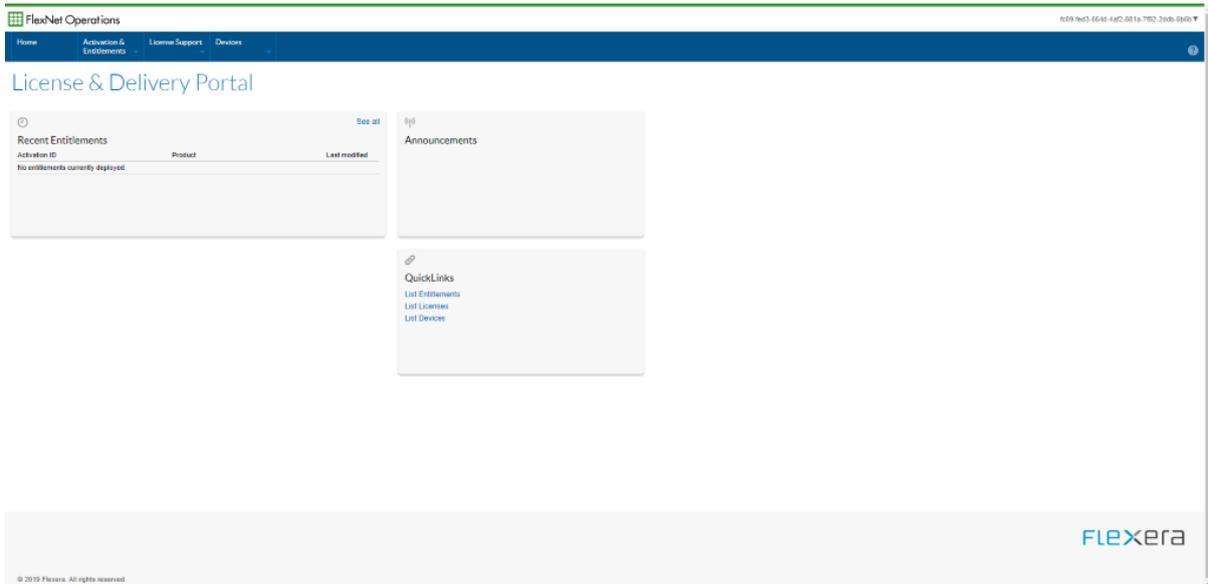


Figure 7 - License and Delivery Portal.

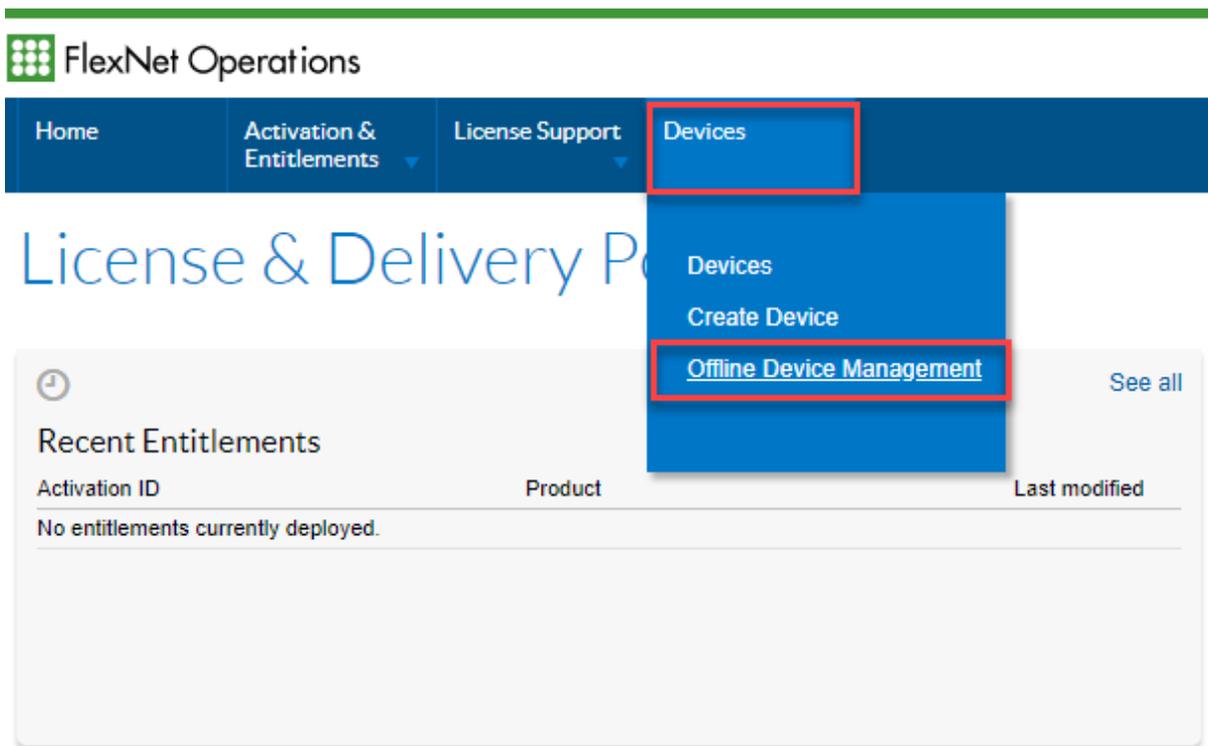


Figure 8 - Select the Offline Device Management Option.

Offline Device Management

Manually upload either a Capability Request or Synchronization History Files for offline processing. The application will offer you a response file to download.

Upload type: Generate license
 Upload synchronization history

Licence Acti... Request.bin

Figure 9 - Offline Device Management.

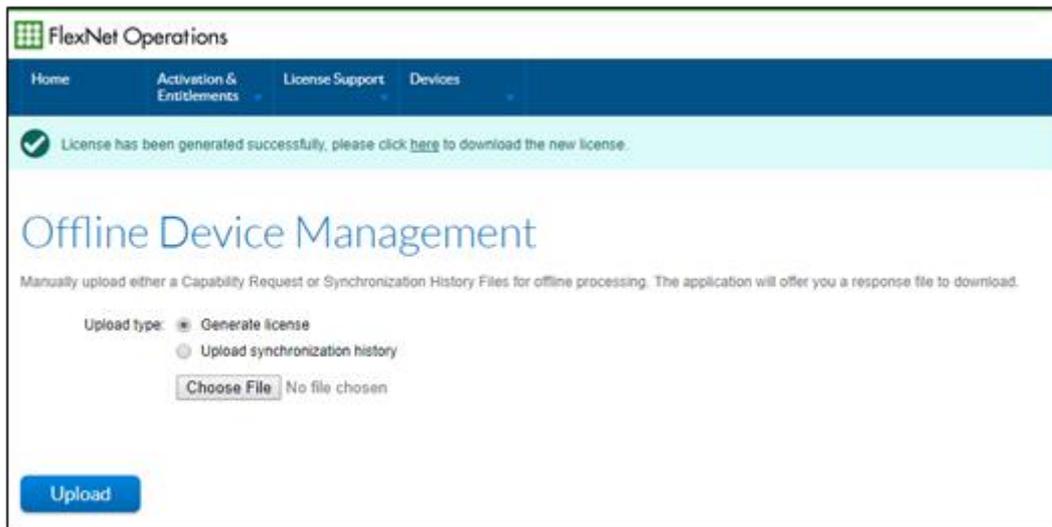


Figure 10 - The FNO Offline Device Management screen, with a link for downloading the “Capability Response” file.

18. Manually copy the *Capability Response* file back to the offline PC and return to the Offline Activation dialog.
19. Step 2 -> **Select -> Load File** and browse to the location of the *Capability Response* file.
20. *Select -> Open* to continue.
21. The software should now be activated and open to the start screen.

Part 3 – Program Interface

File formats

GeoSLAM Connect is designed to work exclusively with GeoSLAM products. However, can be exported to several common point cloud data formats.

Data Type	Format	Format type
Input data format	GeoSLAM, GeoSLAM Zip*	GeoSLAM Binary
Input control file format	TXT	X,Y,Z
Output format	LAS, LAZ, PLY	Binary

Table 3 - File formats used by GeoSLAM Connect.
*GeoSLAM Zip files produced by ZEB Revo/Go scanners

GeoSLAM Viewer interface

Program window

The program window will open to display the main screen (Figure 11). The main window is divided into 2 sections:

1. Toolbar to create new projects and
2. Data visualization window

Main window layout

The toolbar to the left of the display screen contains the controls to create a new project and define the workflow. Once a project is active, all controls will be visible (Figure 12). A description of the toolbar controls is provided in Table 6.

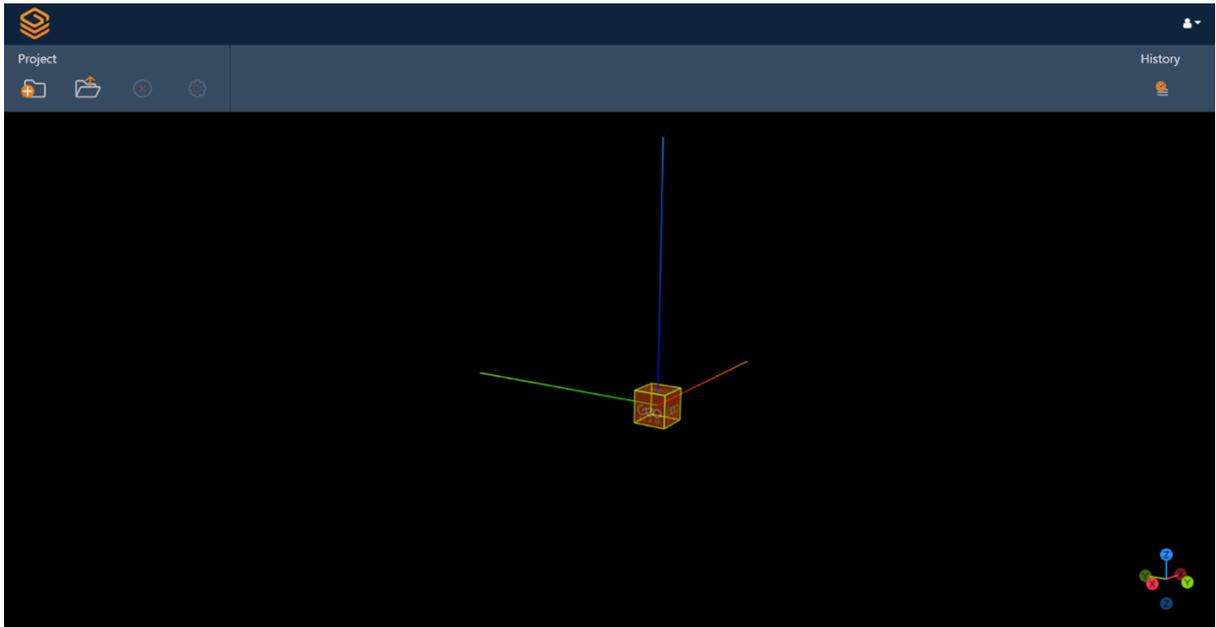


Figure 11 – Connect Viewer interface without a project open

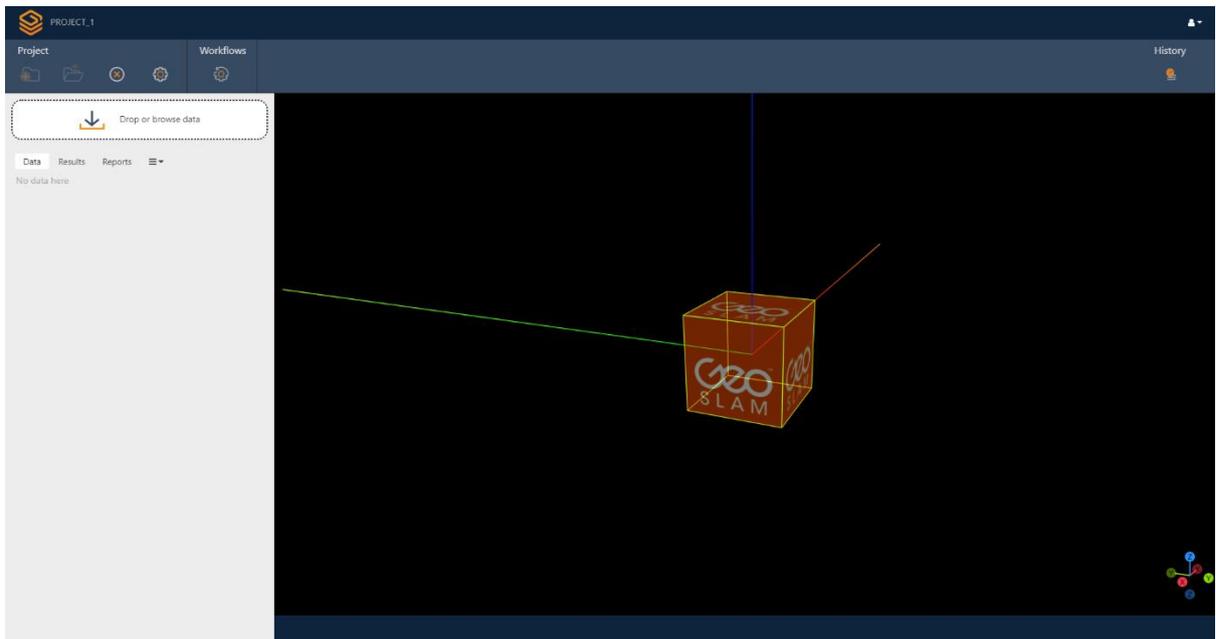


Figure 12 – Connect Viewer interface with a project open

Panel 1 – File menu

Project Tree

The project tree is shown on the left-hand side of the viewer window when a project is active. This will show the input, output and any PDF reports created in that project.

When a project is loaded there are several options available:

1. Import data.
2. Reload/ refresh the project list.
3. Options – Allows the user to change the workflow of the project.

Create a new project

Using the Connect Viewer, each project is set up by defining the project name and a pre-defined workflow.

To create a new project:

1. Open -> Connect GeoSLAM Connect Viewer
2. Select ->  -> Projects->Create New Project
3. This will open the Add New Project dialog (Figure 13).
 - a. Input -> **Setup** ->
 - i. **Project Name.**
 - ii. **Define Workflow.**

The options within the Add New Project dialog are described in Table 4.

Option	Description
Project name	The user must enter a name to define the project. The Project name must start with a letter and contain minimum 4 characters.
Workflow	A list of workflows will appear. Workflows must be saved into C:\ProgramData\LidarOs\geoscripts in order to appear here.

Table 4 - Create New Project input options

4. Select -> Create Project

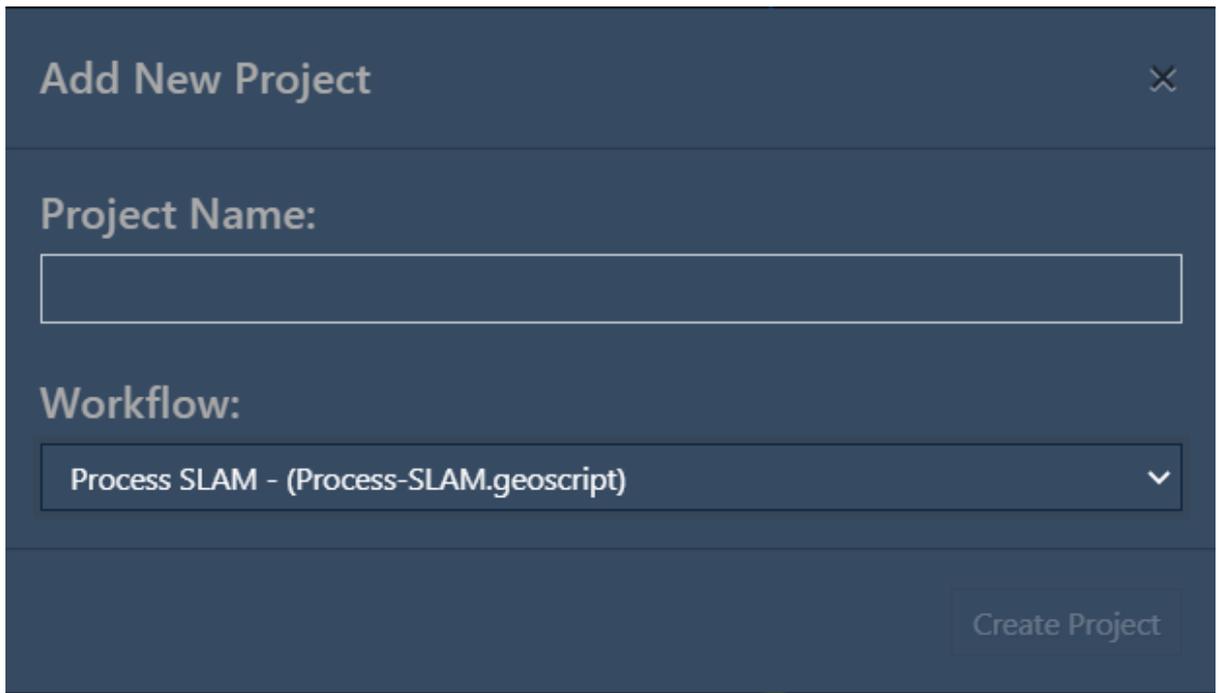


Figure 13 - Add New Project dialogue box

The newly created project will be displayed in the project tree view on the left of the screen. Options to Import, Reload and Options will appear once the project is defined.

Open an existing project

Saved projects will appear as a list in the Project Menu.

To open an existing project:

1. *Open* -> *GeoSLAM PointCloud Viewer*.
2. *Select* ->  -> **Projects**.
3. This will open the project list.
4. *Select* -> required project by double clicking.

Delete a project

Projects can be deleted from this view by clicking the **X** icon.

Panel 2 – Point colour and clipping

Displaying data in the viewer

Once a workflow has completed, the LAZ file will appear in the output folder in the Project Tree.

To view the different output files:

1. Double click on the LAZ file to open in in the viewer window.
2. Floorplan PNG images will open in a new window.
3. Images and notes will appear as icons in the viewer. Double click on the icon in the viewer to open the picture/note (Figure 14).



Use the button to toggle the layers visibility.



Use the button to close the layer.

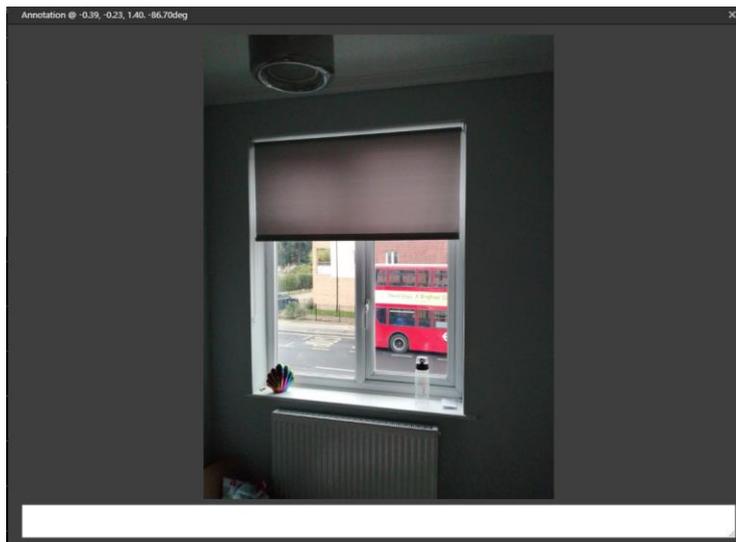


Figure 14 - An example of opening the image from the viewer.

Navigation

The camera orbits a target and is always orientated towards that point. The pitch of the view can be changed however the roll is fixed. When a dataset is opened, the camera will switch to the default view which shows the project from above. These views can be quickly changed using the view settings on the top toolbar (Table 6).

You can use keyboard shortcuts or the mouse to navigate in the Connect Viewer, these are explained in Table 5.

Function	Keyboard shortcut	Mouse
Navigation Mode		
Reset View	T	 Clicking 'Reset View' icon
Rotate	Q,E	Hold down the left mouse button and dragging will rotate the scan
Zoom In	N/A	Mouse Wheel Fwd.
Zoom Out	N/A	Mouse Wheel Rev.
Pan	W,A,S,D	Holding down the right button and dragging will translate the scan position in space.

Table 5 – Navigation options.

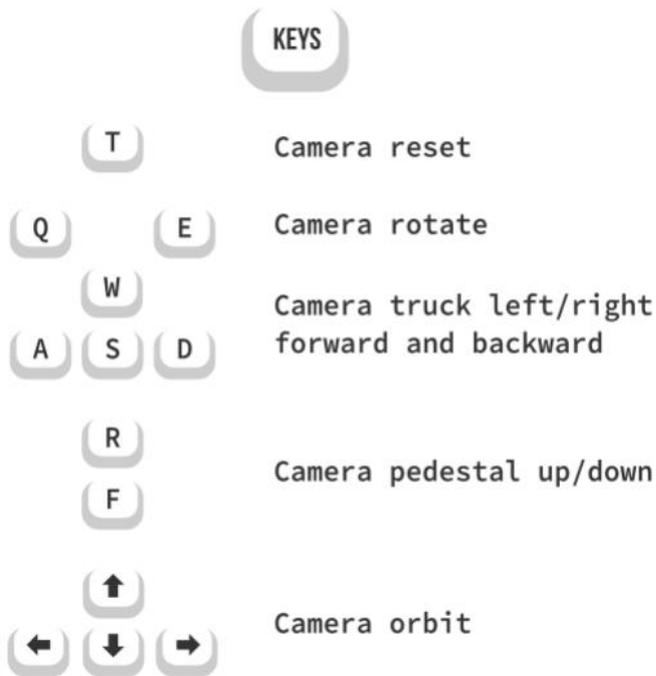


Figure 15 – Navigation using keyboard shortcuts.

Set colour mode

When a LAZ file is loaded in the viewer, the Display Options toolbar is active and allows the user to change the colour mode and point colour.

The LAZ file can be coloured by:

1. Elevation.
2. Solid (single colour).
3. Intensity (for ZEB Horizon data only).
4. RGB.
5. Time.
6. Pre-defined colour maps.

The point cloud layer visibility can be switched on/off using the **Toggle Visibility** button



The point cloud layer can be closed using the **Close** button



Clipping box

When a LAZ file is loaded in the viewer, the Display Options toolbar is active and allows the user to clip the point cloud to an area of interest. Stray points and any points which extend the bounds beyond the area of interest can be clipped using 6 axis-aligned clipping planes.

To clip the point cloud:

1. *Select* -> **Enable Clipping** icon 
2. Click -> select which plane to clip.
3. Drag -> arrow to desired position.
4. Press -> Escape key to end clipping.
5. *Click* on the Reset Clipping icon to undo any changes



Save views

Customisable views of the display window can be saved to review for future reference or to include in a PDF report (Figure 16). The current clipping and camera position will be saved.

To save a view:

1. *Select*-> **Add New View** icon.
2. *Input* -> View name.
3. *Select* -> **Save View**.

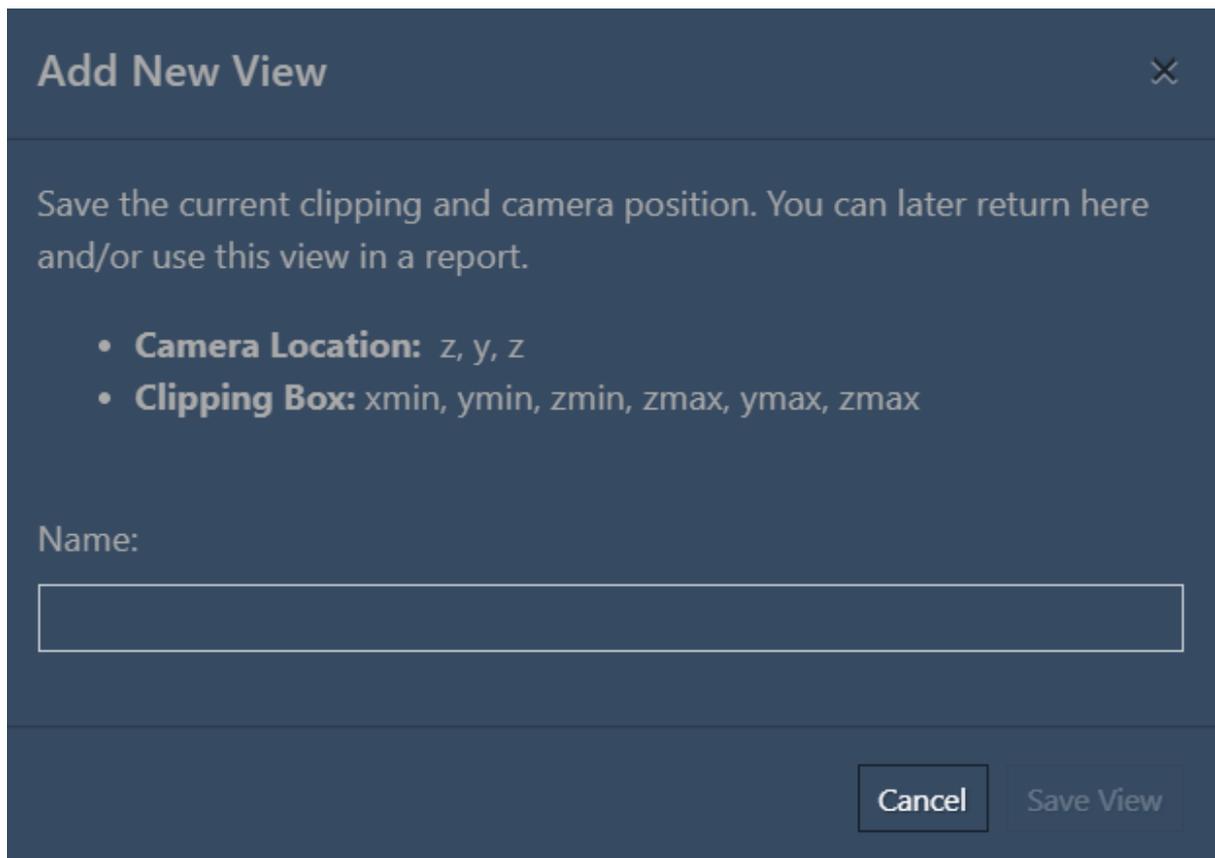


Figure 16 - Add New View dialog box.

Panel 3 - View modes and reporting

Display Options Toolbar

Icon	Function	Description
	Set Background Colour	Change the display background to a solid colour.
	Toggle Grid	Switch the reference grid on/off.
	Toggle reference Cube	Switch the reference cube on/off.
	Eye Dome Lighting	Switch shading to improve depth perception on/off.
	Eye Dome Lighting Value	Change the value of EDL filter (recommended 50).
	Reset View	Camera position reverts back to the default.
	Left View	Switches camera view to target the left clipping axis.
	Right View	Switches camera view to target the right clipping axis.
	Front View	Switches camera view to target the front clipping axis.
	Back View	Switches camera view to target the back clipping axis.
	Top View	Switches camera view to target the top clipping axis.
	Bottom View	Switches camera view to target the bottom clipping axis.
	List of Saved Views	Drop-down list of all saved views.
	Add New View	Save the current clipping and camera position.
	Generate Report	Generate PDF report using saved views.
	Close All	Close all views.

Table 6 – Description of display toolbar options.

Pdf reporting

Selecting the *Generate Report* icon will open a secondary *Generate Report* Dialog (Figure 17).

Create Report [Close]

This will generate a simple PDF report containing the text below and a screenshot from the current 3D view.

The report will be saved to the Reports folder in this project

Name:

Include Saved View:

Choose Saved View...



Add

Clear

Notes:

Cancel

Generate Report

Figure 17 – Create report dialog box.

To create a report:

1. *Select* -> **Generate Report** icon.
2. This will open the *Generate Report* dialog (Figure 17).
3. *Input* -> Report name.
4. *Select* -> Saved views to include in the report.
5. *Input* -> Any project notes to be included.
6. *Select* -> Generate report

The report will be created and saved to *C:\ProgramData\LidarOs\projects*PROJECTNAME*\Reports*. The output will appear on the Project Tree list under **Reports**.

7. *Double click* -> on the newly generated report.

This will open the PDF report using the default web browser. The report will display the notes at the top of the PDF and selected saved views and their titles on separate pages.

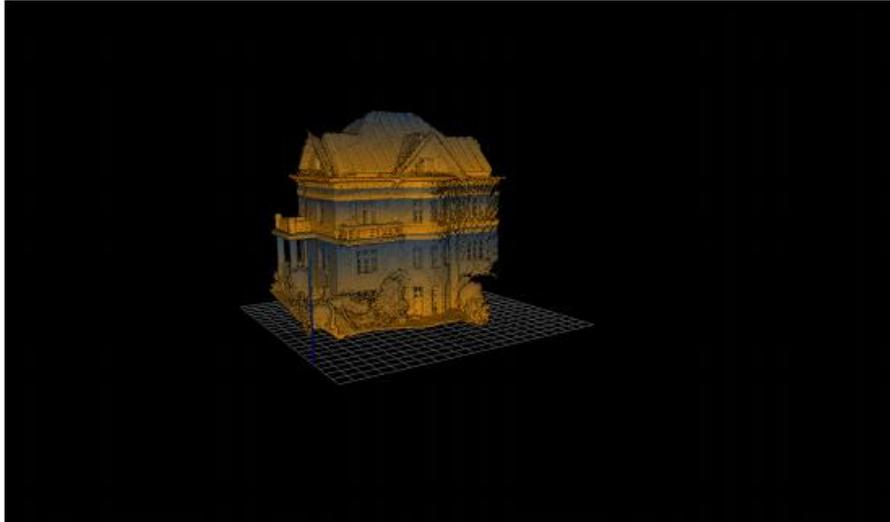
Once a report has been created, it cannot currently be edited. There is no limit to the amount of reports than can be created per project, each report will appear in the project tree list under **Reports** and saved in *C:\ProgramData\LidarOs\projects*PROJECTNAME*\Reports*.

Villa

2020_12_16 09_57_05



NOTES:



Villa

1 of 1

Figure 18 – PDF report example.



Please note when deleting a project from the project list, it will also be permanently deleted from the projects folder in C:\ProgramData\LidarOs\projects.

Importing data

To import data into the project:

1. *Select* -> **Drop or browse data**.
2. From the *Open* dialog, browse to the data folder containing the data to import.
3. *Select* -> *user defined file(s)*.
4. More than one file can be selected at this stage e.g., scan data and zipped GeoSLAM Note data.
5. *Select* -> **Import**.
6. This will close the dialog box.



A progress bar will appear at the top of the Project Tree indicating how many datasets have been imported. This will show the progress of the whole workflow, and the processing time will be determined by the size and length of the scan imported.

Reload

The reload button will refresh the active project list to display any changes. Once a workflow has completed the project list will be refreshed automatically and the output data displayed on the Project Tree.

Options

To change the current workflow for the project:

1. *Select* -> **Options** .
2. *Select* -> Workflow from drop-down list.
3. *Select* -> **Close**.

Notification will show that the project workflow has been changed.

Part 4 – GeoSLAM Draw 4.0

Connect comes with GeoSLAM Draw 4.0. GeoSLAM Hub is installed with Draw 3.6, so if you want to install Connect on a machine that already has Hub installed, there are a few things you need to know before installing Connect:

- Before installing Connect, you should uninstall any existing Connect and Draw software.
- You will need to refresh your Draw license using the new GeoSLAM License Manager to update it to the new 4.0 version.
- Once you have installed Connect, Hub will recognise the new Draw 4.0 version.
- Projects created or opened in Draw 4.0 are not compatible with Draw 3.6. Your customers will still be using Draw 3.6 (or earlier), so bear this in mind if you are sharing Draw data with them.
- If you wish to revert back to Draw 3.6 you will need to uninstall Draw 4.0 and then reinstall Draw 3.6.

Draw packages are purchased separately and come in the following industry packages: Start, Plan, BIM, Mining and Pro.

Draw Interface

The GeoSLAM Draw interface has been updated to reflect the same colour scheme as GeoSLAM Connect.

Opening/creating a Draw project

When a point cloud is loaded in the GeoSLAM Connect viewer, right click the .LAZ file and select the option 'Open in GeoSLAM Draw'. This will create a new notification to indicate the project is opening and another to confirm the project has been created. GeoSLAM Draw will open in another window.

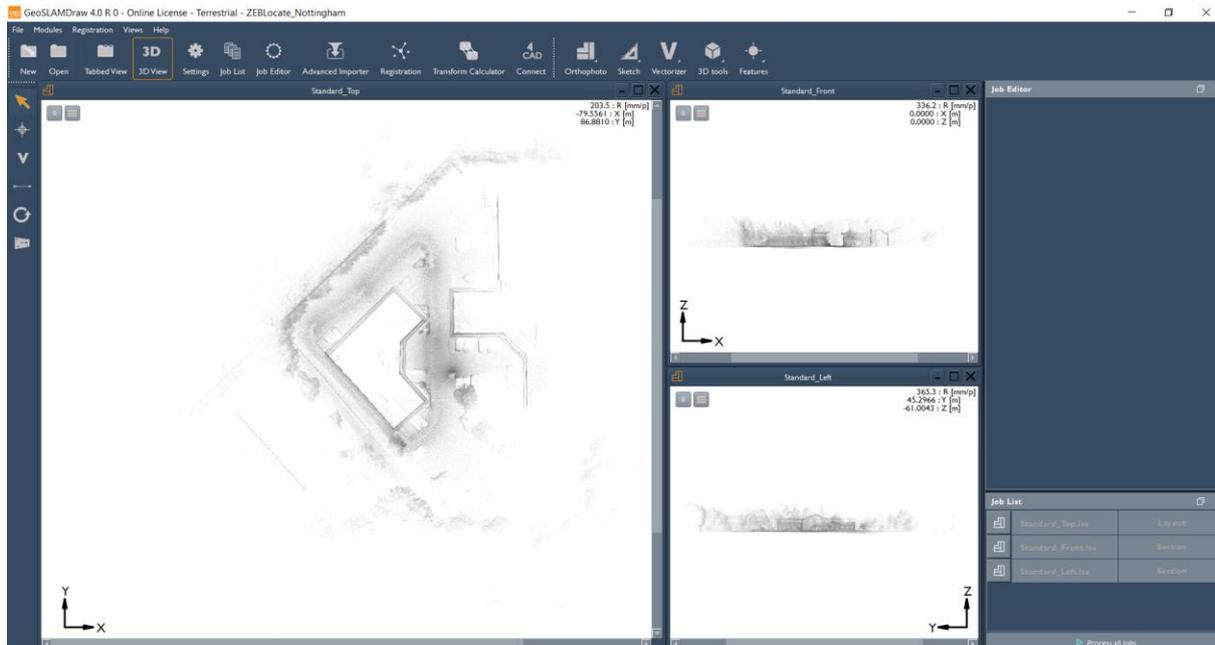


Figure 19 – Draw 4.0 interface

New features

General Improvements

- Customisable shortcuts, icons and font sizes
- Ability to change the project name
- Select export by .dwg/.dxf
- Multi-selection for scan cluster
- When jobs are deleted, the results in the results folder are also deleted
- Abbreviated output names for results

Draw Start

- Select all closed polygons in vectorisation and convert them to area elements automatically
- Vector to distance conversion
- Import an align element from other projects
- Multiple .las files are automatically sorted into clusters in the same project
- Rotate scans after import
- Angles can be re-adjusted in the vectoriser tool
- Move distance and text annotations freely

Draw Plan

- 3D location and visualisation of polygonal, elliptical and curved sections for CAD
- Add points to polygonal tools retrospectively
- Hidden elements are not exported in web export

Draw BIM

- Use planes to improve registration
- Accuracy of features added to the registration report
- Layers created in Draw are automatically adopted in CAD

These new features will also be available in the Draw Mining and Draw Pro packages.

Part 5 – Technical reference

GeoSLAM Connect can process data from any of our mobile mapping product catalogue. This section will outline the best practices for scanning sites which is applicable to all of our ZEB family of mobile mapping products.

Prior to conducting any survey, the user should plan the data capture in order to ensure data is captured sufficiently. Planning will also highlight any potential problem areas e.g. environments with few features, doorway transitions and hazards. In order to achieve the best results when using GeoSLAM 3D change, ensure these guidelines have been followed correctly whilst capturing data.

Further tutorials and videos on how to capture data can be found on the GeoSLAM YouTube channel or GeoSLAM Academy.

Data capture – Scan

In order to register the reference scan to subsequent comparison scans and track the 3D change, it is important to start and end the scan in the same place. Throughout the scan there must also be at least 3 control points taken where the scanner has been placed and left static for 10 seconds. In each subsequent scans the control points must be in the same location to accurately match and register the scans. The use of base plates that are secured to an object that is static are recommended to ensure the operator returns to the same location each time.

Data capture – GeoSLAM App

Ensure there is some movement before the first image is taken to allow the software to recognise when there is a static period during image capture (minimum 5 meters between starting the scan and capturing the first image).

When capturing an image or note, remain static for at least 5 seconds. This will allow the software to accurately match the trajectory of the scanner and images during image capture periods.

There is no limit to the number of images that can be captured, however it is recommended to capture a minimum of 2 images per project (if images are required).

To begin data capture:

1. *Select* -> Start recording icon.
2. *Select* -> Capture icon.
3. *Take photo*.
4. *Select* -> tick to confirm image is correct.
5. *Add notes*.
6. *Save after each image captured*.
7. *Select* -> Stop recording icon to complete the image capture.

The Environment

The SLAM algorithm used to process the raw laser scan data into a 3D point cloud requires a variation in geometry and features within the scanning environment in order to correctly compute the position of the scanner in relation to its surroundings. For a feature to be significant the ratio of its size to its range must be approximately 1:10, e.g. at 5m range for a feature to be significant it must be >0.5m in size.

'Feature poor' environments include open spaces and smooth walled passageways. In smooth walled passageways there may be insufficient features in the direction of travel for the SLAM algorithm to determine forward motion. In feature poor environments we recommend the following:

1. Where possible, augment the environment with additional features. e.g. boxes in a corridor or a parked vehicle in an open field.
2. Ensure that whatever limited features are available are scanned repeatedly as you move through the environment by pointing the scanner in the direction of the feature. By doing so more measurement points are made of the feature increasing the likelihood that it will be used by the SLAM algorithm. This is particularly important when the feature is at long range (>10m). e.g. when scanning a smooth walled passageway where the only feature in the direction of travel is the end wall or door.
3. Avoid scanning moving objects (e.g. passing pedestrians or vehicles) as the SLAM algorithm may lock on to these objects as static features.

Loop Closure

The SLAM algorithm used to process the raw scan data into a point cloud uses a method analogous to the traverse technique used in survey practice, in that a previously known position is used to determine its current position. Not "closing the loop" can result in the compounding of any error introduced causing measure position to "drift". It is good survey practise to "close the loop" by re-surveying a known position so that the compounded error can be spread around the loop. As a minimum, it is required that the operator must start and end the survey in the same position to ensure at least one loop closure. However, it is recommended where possible that the operator closes the loop as often as possible in order to minimise error and improve the accuracy of the resulting point cloud. In general, it is better to do circular loops rather than "there and back" loops where the survey path simply doubles back on itself. This applies to horizontal and vertical loops, i.e. if possible enter and exit through different doors, move between floors via different stair wells. It is important to scan the closed loop regions carefully to ensure the key features are scanned from a similar perspective. It may be necessary to turn around if you return to a region from a different direction. This is particularly important in feature poor environments.

Transitioning Between Environments

Extra care must be taken when transitioning between environments, for example passing through a doorway or turning through a tight bend to avoid introducing errors. When

transitioning between environments the local view may change abruptly and the SLAM algorithm may have difficulty placing the new environment relative to the previous environment. This may result in rooms either side of a doorway being slightly misaligned. Transition through doorways slowly and ensure that there is a period when the scanner can view features on both sides of the doorway (i.e. into both rooms). Try to open all doors before starting the survey. Avoid scanning doors as they are being opened. If necessary, face away from the door and open from behind then pass through the doorway backwards. Transition around tight bends slowly and ensure that there is a period when the scanner can view features on both sides of the bend. Take care when transitioning from an enclosed feature rich environment to an open feature poor environment, for example exiting a building. It may be necessary to turn and face the exit and the exterior of the building if no other features are within range. Avoid scanning any other moving objects (e.g. walking pedestrians) as you pass through a transition.

Walking Speed

It is recommended that data is captured at a slow walking pace to ensure good coverage and high-resolution data. If the forward movement is too fast there may not be enough repeat scans of features for the SLAM algorithm to be able to process the raw laser data into a point cloud.

Minimum and maximum range

Data within a small range value is not processed (by default) to eliminate data from the scanner operator being included in the final point cloud. Avoid close proximity to walls and ceilings. The maximum range of the Go/Revo RT scanners is 30m and the Horizon is 100m. This range will only be achieved in optimal conditions (indoors with good target reflectivity). The typical maximum range will be 15-20m for the Go/Revo in most conditions. It is recommended that the range is kept to less than 10m for these systems where possible to ensure good point density and to assist the SLAM algorithm.

Duration of scanning

For very large surveys the project should be broken down into more than one scan mission. This is to avoid very large file sizes as well as reduce any drift that might be created in the data. It is recommended that each survey is limited to 25 minutes. At walking pace, it is possible to cover approx. 2000m of survey distance.

Survey areas with restricted or difficult Access

The scanner head can remain stationary for short periods of time whilst the operator negotiates difficult access points (e.g. tight squeezes in cave systems). The scanner head can

also be held in the hand and moved up and down to mimic the normal oscillating motion for short periods of time to assist transition through survey areas with restricted or difficult access.

Moving Objects in The Environment

In most case the SLAM algorithm is able to handle moving objects in the environment. In order to estimate the scanner motion the algorithm must assume a large proportion of the environment is static. However, in some feature poor environments where 3D structure is lacking in some dimensions, moving objects can have a greater impact on the solution. In particular, moving objects should be avoided in long tunnel-like environments (e.g. corridors), relatively open spaces and when transitioning through doorways. It is best practice not to have other people closely accompany the operator during the scan acquisition as they will be scanned throughout the map leaving streaks of data and potentially corrupting the solution in feature poor environments. If people are required to follow the operator they should ideally maintain a distance of 20m or more from the operator.