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Version 3.2.0

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1. INTRODUCTION

This guide describes how to install and use GeoSLAM Desktop, the desktop application for processing raw scan data captured using GeoSLAM ZEB1 and ZEB-REVO hand held mobile laser scanners.

The software kit comprises:

- 1 x Kingston USB memory stick, containing installation files and test data and user guide
- 1 x Safenet HL USB software license dongle (green dongle)

1.1 SYSTEM REQUIREMENTS

The host machine on which GeoSLAM Desktop is to be installed must meet the following system requirements:

- Windows 10 operating system **
- CPU must support virtualisation technology (AMD-V or VT-x) and virtualisation support must be enabled in BIOS (basic input/output system). Most modern CPUs support this feature, and it should be enabled by default.
- The GeoSLAM binary is optimised for Intel Core i7 processors and we recommend using this processor or equivalent.
- VirtualBox 5.1.22 or above (if VirtualBox is already installed. If not, you will be asked to download and install VirtualBox at the start of the installation procedure).
- Minimum of 8 GB RAM is required (of which a minimum of 6 GB must be available for the VirtualBox application) *It is therefore recommended that no other memory intensive applications are running on the host machine whilst the GeoSLAM software is running.* 16 GB of RAM is recommended.
- 30GB free disk space

** This installation guide is intended for use with Windows systems. If you run Macintosh OS X or Linux operating systems please contact GeoSLAM software support for further guidance.

2. INSTALLATION

This chapter describes the installation for new users performing a “fresh” install. Existing users updating from an older version of GeoSLAM Desktop should follow the instruction guide provided with the update.

To install GeoSLAM desktop double click the *GeoSLAM Desktop Setup 3.x.x.exe* file in the root of the USB memory stick you received in your software kit. The setup procedure will present the GeoSLAM End User License Agreement (Figure 2-1). It is necessary to accept the license agreement in order to proceed with the installation. A copy of the agreement is included in Chapter 9 of this document. To accept the agreement, scroll to the end and click the *I Agree* button.

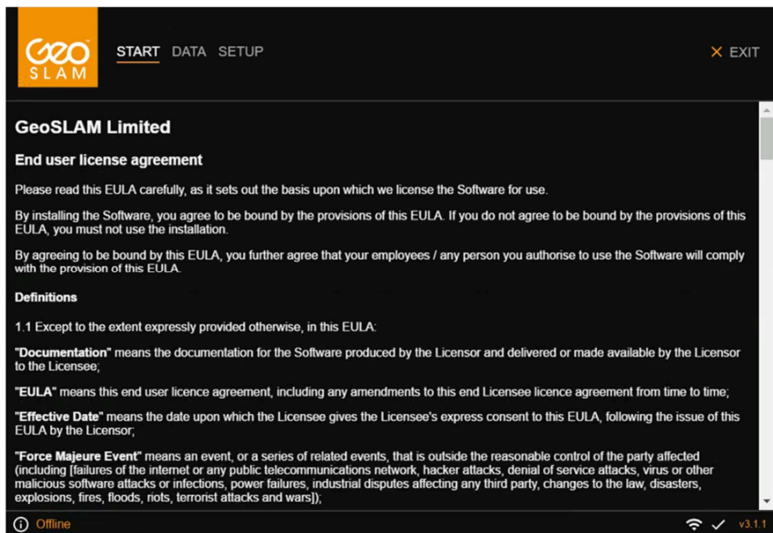


Figure 2-1

The setup procedure will ask if you want to enable Automatic Updates – Figure 2-2. With this feature enable the software can automatically check for software, calibration file or license dongle updates. It is recommended that Automatic Updates is enabled. To enable Automatic Updates slide the enable switch to the right (switch turns purple when enabled) and click Save Configuration.

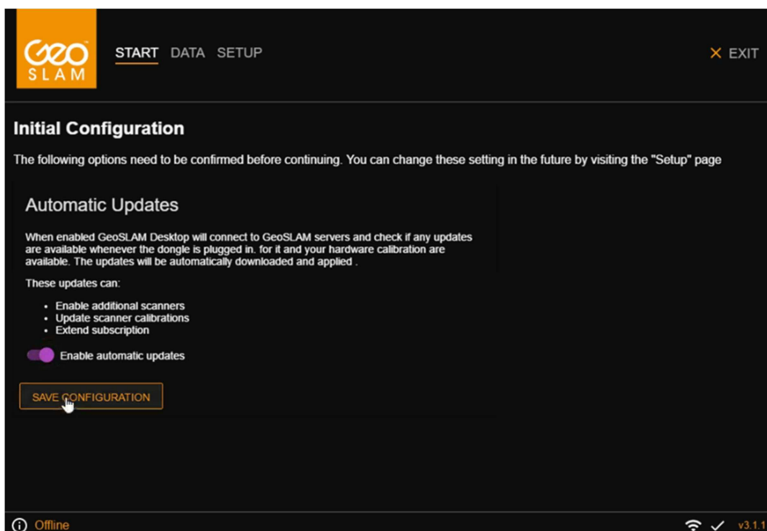


Figure 2-2

The Setup procedure will check to see if you already have a valid version of VirtualBox installed. If a valid version of VirtualBox is not installed the first screen you will see is shown in Figure 2-3. Click in the box labelled “Please download and install VirtualBox” and follow the instructions in Section 2.1 - Installing Virtual Box. Note – your computer must be connected to the internet in order to download and install VirtualBox.

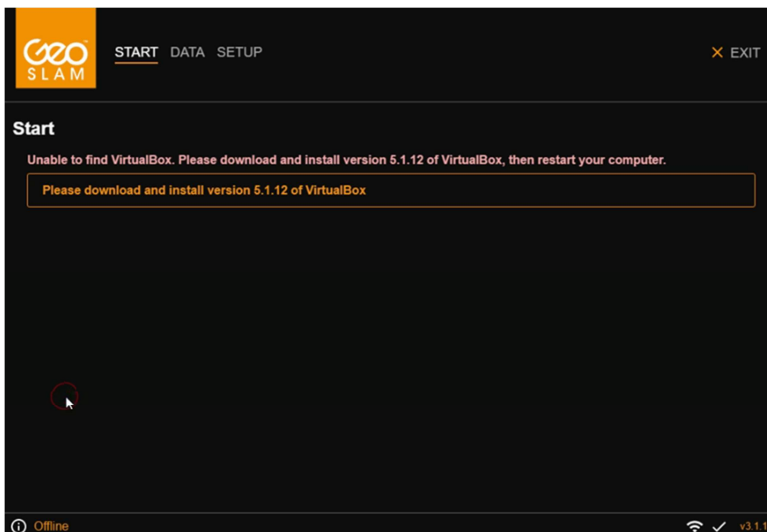


Figure 2-3

If a valid version of VirtualBox is already installed the first screen you will see is shown in figure 2-4. Please proceed to **Section 2.2 – Installing the Processing Engine**.

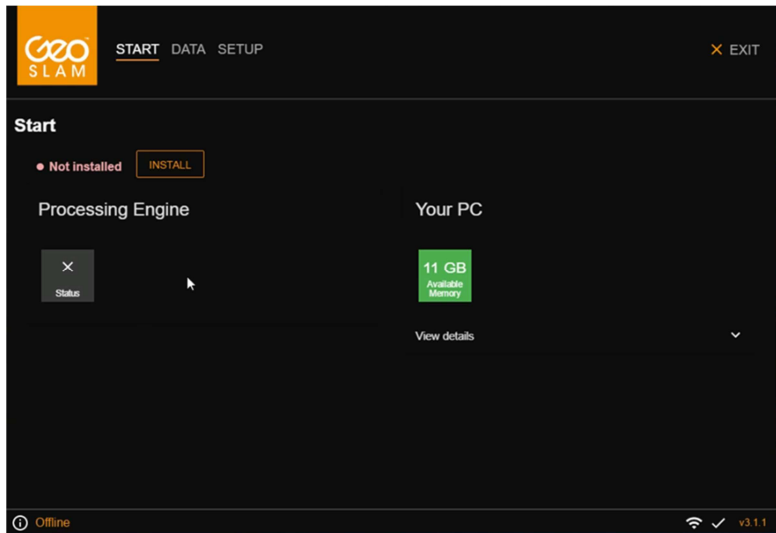


Figure 2-4

2.1 INSTALLING VIRTUALBOX

The Setup procedure indicates which version of VirtualBox should be installed (Figure 2-3). Click the “Please download and install Version X.X>X of VirtualBox” field and the application will open the Oracle VirtualBox website on the download page for the latest approved release of VirtualBox for running GeoSLAM Desktop as shown in Figure 2-5.



Figure 2-5

Ensure you select the version number recommended by the setup procedure (it may not be the version at the top of the Oracle download page).

Click on the download link next to the VirtualBox for Windows hosts - *x86/amd64*.

VirtualBox will begin to download to your machine.

Once downloaded, run the VirtualBox setup executable. It will take you through the setup steps shown in Figures 2-6 to 2-12. Accept the default settings by clicking *Next* or *Yes* up to Figure 2-10. At the final step “Installation Complete” – Figure 2-12, **uncheck the Start oracle VM VirtualBox checkbox** and click on Finish

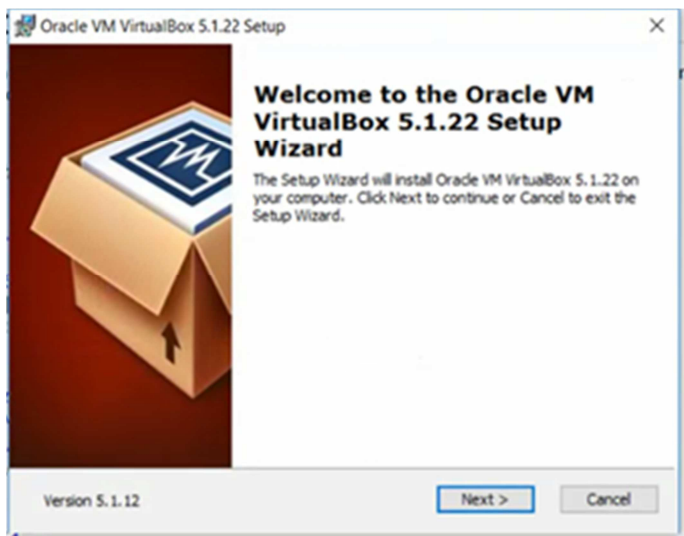


Figure 2-6

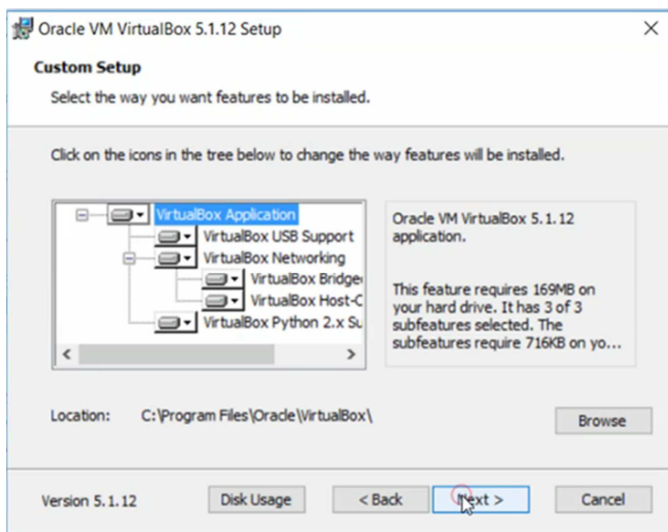


Figure 2-7

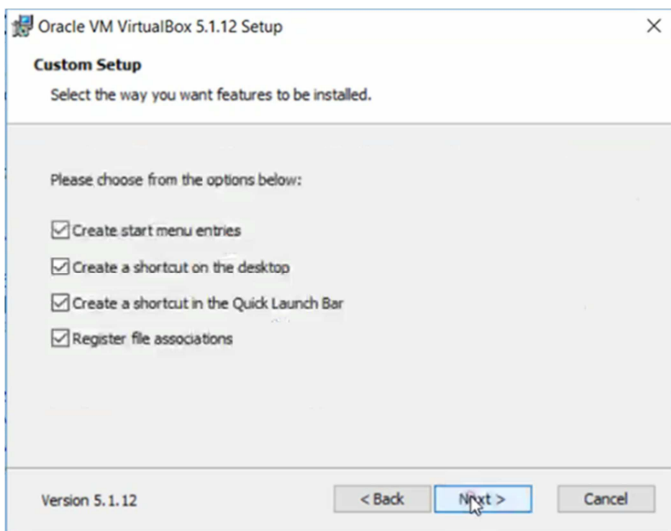


Figure 2-8

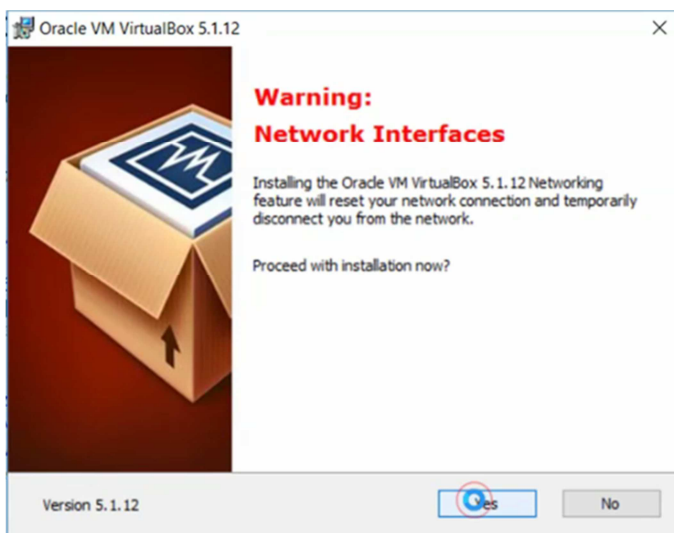


Figure 2-9

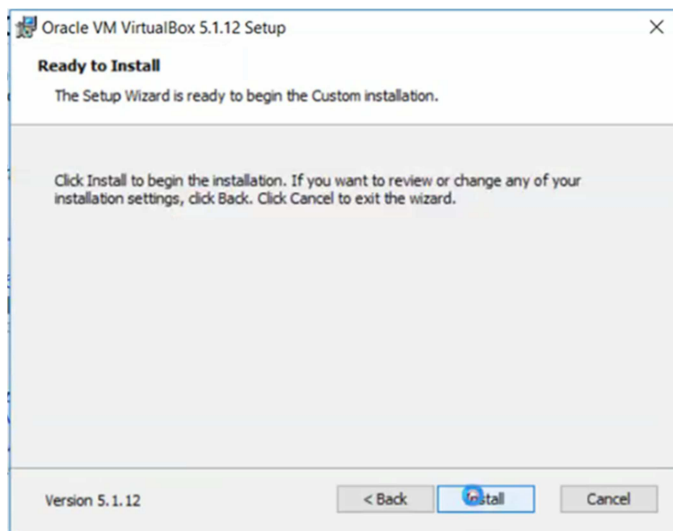


Figure 2-10

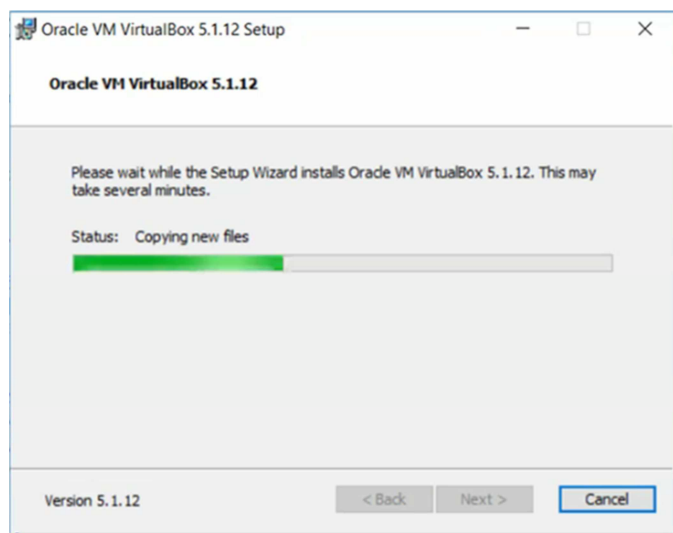


Figure 2-11



Figure 2-12

After the installation is complete, close the VirtualBox application (which starts up automatically if the checkbox in Figure 2-12 is left checked).

Close the GeoSLAM Desktop application by click Exit in the top right of the application window.

Restart the GeoSLAM Desktop application by clicking the GeoSLAM icon that has been added to the Windows Desktop or search in the Windows Start menu. The screen shown in Figure 2-13 should be displayed and you are ready to proceed to the next section, **Section 2.2 Installing the GeoSLAM Desktop Processing Engine.**

2.2 INSTALLING THE PROCESSING ENGINE

To install the GeoSLAM Desktop Processing Engine, click on the *INSTALL* button as shown in Figure 2-13

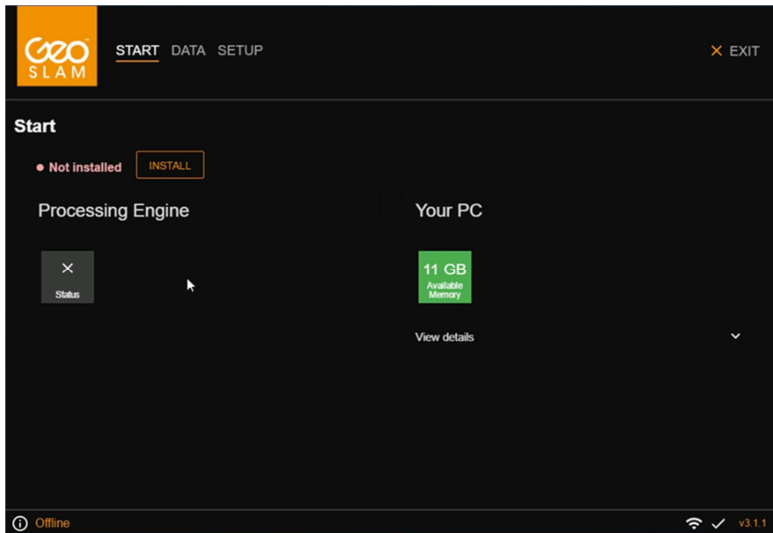


Figure 2-13

A pop-up window (Figure 2-14) will appear asking if you want to download the Processing Engine or install from a local file location. The Processing Engine is supplied on the USB memory stick in the software kit. If you have a local copy of the processing engine (*geoslam-vm.ova*) (e.g. on the USB memory stick) select the Local option. A directory selection window will appear (Figure 2-15). Navigate to the directory containing the Processing Engine, e.g. the root directory of the red USB memory stick and click *Select Folder*.

If you do not have a local copy of the Processing Engine select the Download option. Note the Processing Engine is a large file > 900MB

The Processing Engine will be automatically installed. This process may take several minutes. When the installation is complete the screen shown in Figure 2-16 will be displayed and you will be prompted for the Configuration files. These files are unique to your ZEB hardware. The files can either be downloaded or copied from the red USB memory stick shipped with the software. Select the appropriate option.

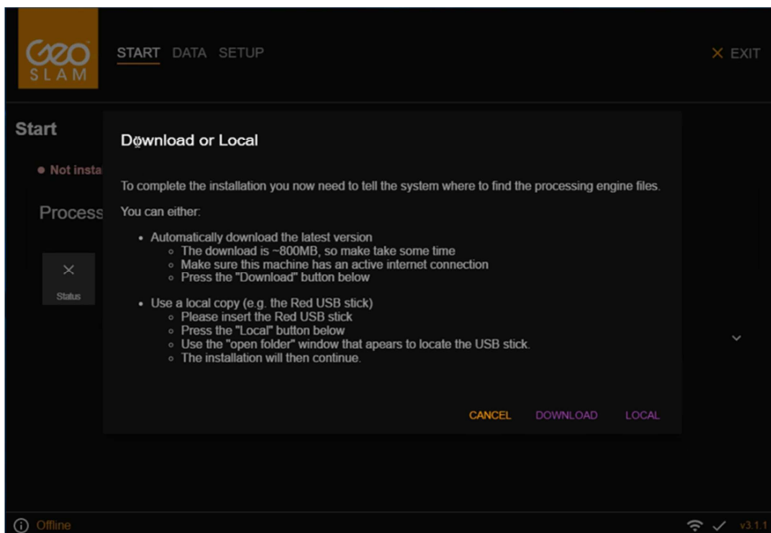


Figure 2-14

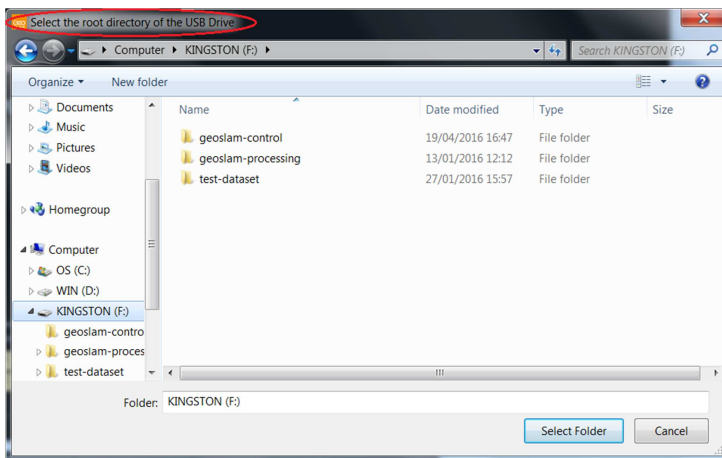


Figure 2-15

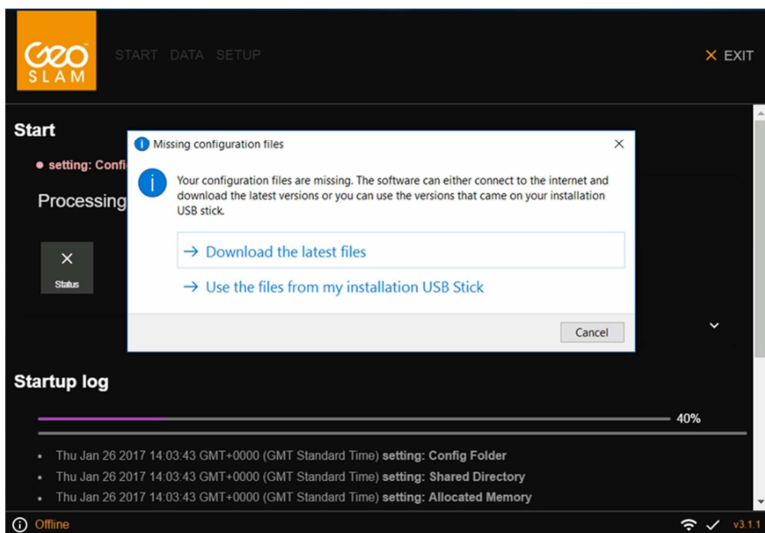


Figure 2-16

If you select the Download configurations the application will then prompt you to insert green Safenet HL software security dongle into a spare USB port so that it can identify and download the hardware specific Configuration files (Figure 2-17).

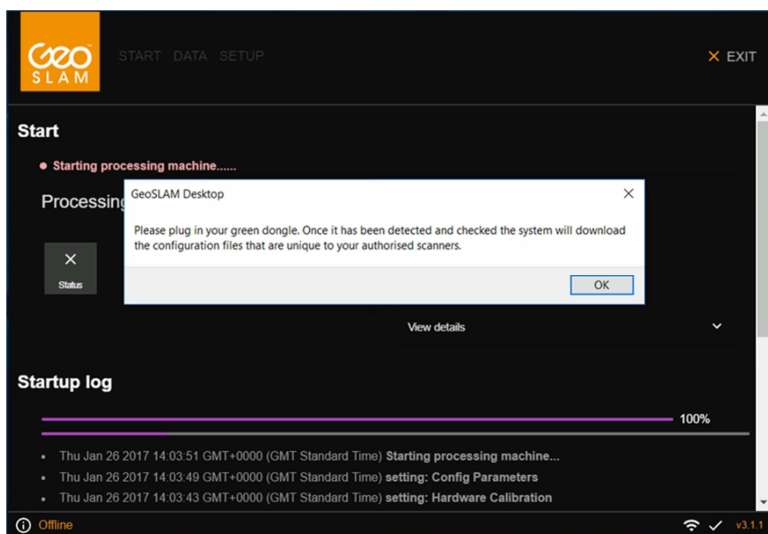


Figure 2-17

If you select the Use Local Configuration files option you will be prompted to navigate to the root of the USB memory stick containing the configuration files. After the configuration files are copied the application will prompt you to insert green Safenet HL software security dongle into a spare USB port (Figure 2-18).

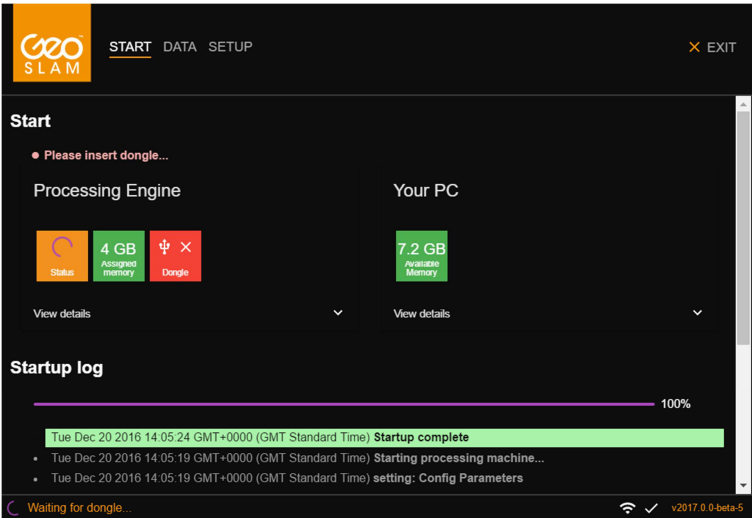


Figure 2-18

After the green software protection dongle has been attached the application will complete the installation and the screen shown in Figure 2-19 is displayed.

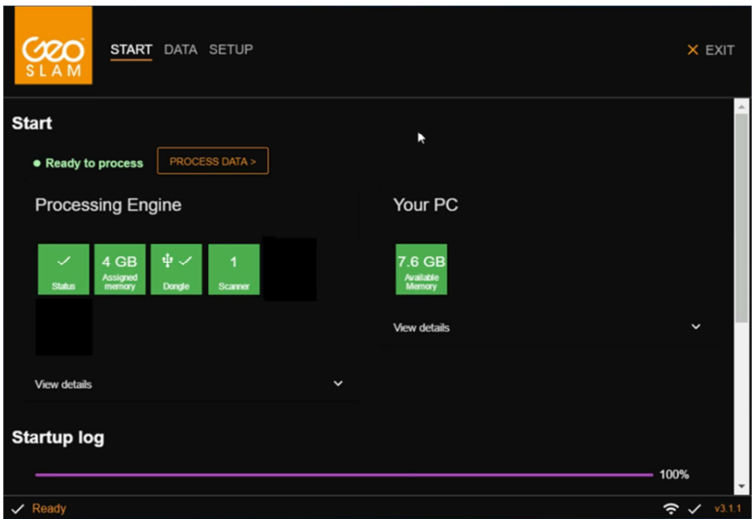


Figure 2-19

2.3 PROCESSING THE EXAMPLE DATASET

To process data, click on the *PROCESS DATA* button. The application will switch from the START page to the DATA page as shown in Figure 2-20.

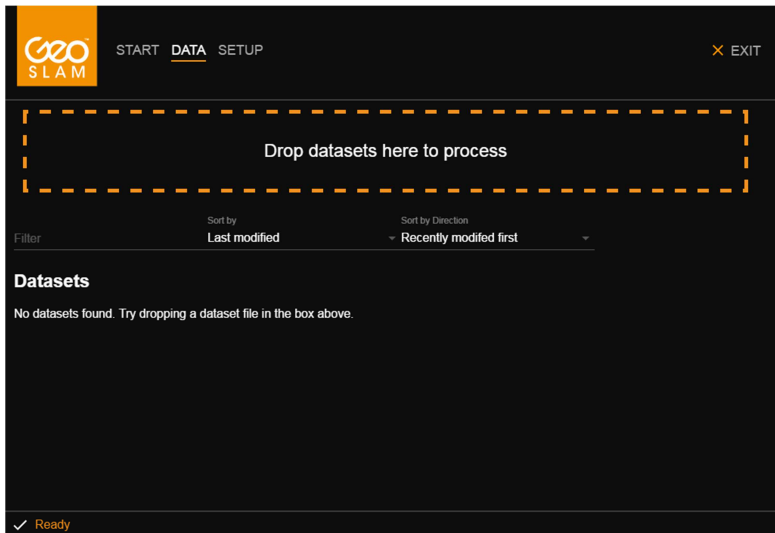


Figure 2-20

Open Windows Explorer and navigate to the test-dataset folder on the USB memory stick. Drag the *2015-12-01_10-33-48.zip* test data set into the drag and drop field on the user interface. The application will copy the dataset into a processing folder and then open the Options dialogue page shown in Figure 2-21. The Options dialogue page presents the user with two option settings tabs: OUTPUT tab and PROCESSING OPTIONS tab. These configuration options are described in more detail in Chapter 3. For now accept the default configuration by clicking the **PROCESS** button.

The display will switch back to the DATA page and a processing progress bar is displayed against the data set being processed. The data will take approximately as long to process as it did to capture (using default processing output and processing options). Data processing may take considerably longer if none default settings are selected. In particular, processing of video data from ZEB-CAM can add considerably to the data processing time. Once the data has completed processing the user is presented with the options shown in Figure 2-22. The user can either:

- Save the results folder to another location (in order to access the point cloud data files). The results files are described in more detail in Chapter 5
- View the data in GeoSLAM Viewer (provided this option was enabled before processing) . The GeoSLAM Viewer is described in more detail in Chapter 4.
- Reprocess the data using different output and processing options.

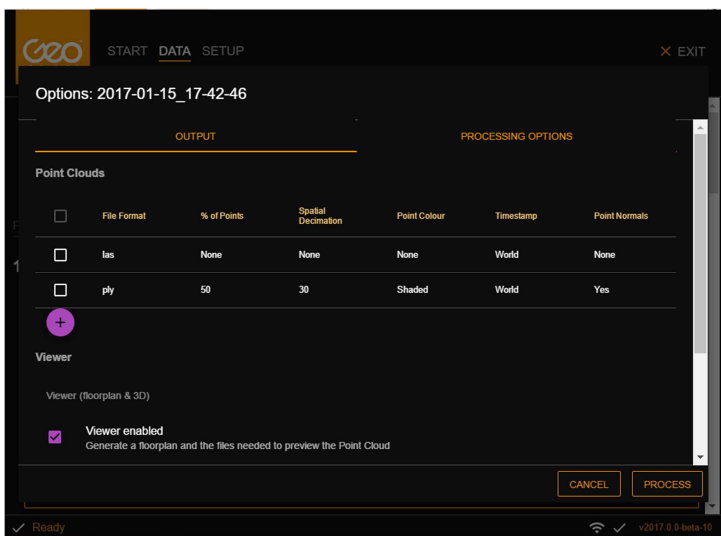


Figure 2-21

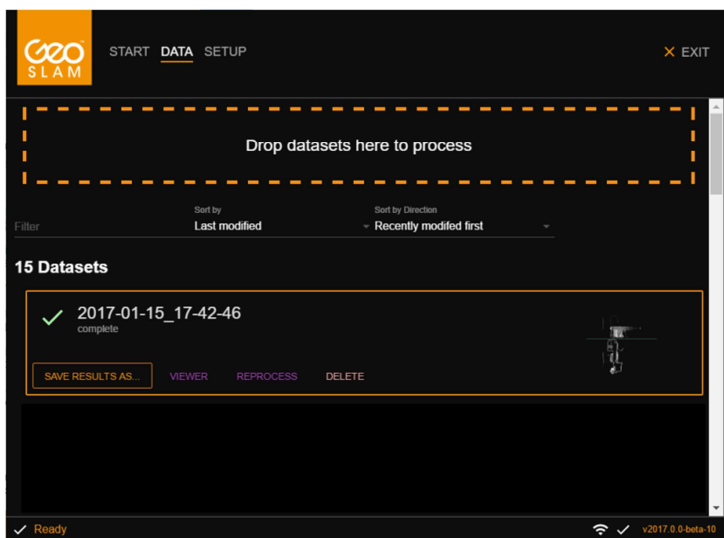


Figure 2-22

3. OUTPUT AND PROCESSING OPTIONS TAB

3.1 OUTPUT OPTIONS TAB

The OUTPUT tab (Figure 3-1) enables users to:

1. Select the configuration of point clouds output after processing
2. Enable or disable output of files for the GeoSLAM viewer
3. Enable or disable processing of ZEB-CAM video data for inclusion in the GeoSLAM viewer files (so called Videolink)

Options: 2017-01-15_10-31-57

OUTPUT

PROCESSING OPTIONS

Point Clouds

<input type="checkbox"/>	File Format	% of Points	Spatial Decimation	Point Colour	Timestamp	Point Normals
<input type="checkbox"/>	las	None	None	None	World	None
<input type="checkbox"/>	ply	50	30	Shaded	World	Yes

☒ +

Viewer

Viewer (floorplan & 3D)

☒ **Viewer enabled**
Generate a floorplan and the files needed to preview the Point Cloud

Viewer point cloud PLY file
50% - 30mm - shaded - world - normals


☐ **Videolink disabled**
View contextual video along side you scan in the GeoSLAM Viewer


Figure 3-1

3.1.1 OUTPUT FILE CONFIGURATION

Users can select from the following options:

File Format	select from	e57 las laz ply txt (ascii)	
% of points	Enter percentage of points to be output Enter 100% to output all points		
Spatial decimation	Enter a value in millimeters to spatially decimate the output. Groups of points within this distance are averaged into a single point resulting in a more consistent and smoother point cloud Leave blank for no spatial decimation		
Colour by	Writes a colour value (RGB 0-255) for each point select from	Height Time Shaded Condition Shape	Single colour gradient Colour scale from red to blue Ambient occlusion grey scale Colour scale of SLAM condition, blue good, red poor Flat surfaces are coloured pink, non-flat surfaces coloured blue to green
Timestamp	select from	World Scan time None	Unix timestamp when the data was captured Time since start of scan No time stamp
Include normals	Check the checkbox to include point normals in the output file (This option is not supported in las and laz formats)		

To create a new file format click the  button, select the file attributed required from the drop down lists and click ADD.

There are two default file formats preselected. To deselect either of these output files check the checkbox next to the file definition and click the  button.

Enable/Disable Viewer (default Enabled)

To enable the viewer simply check the Viewer Enable checkbox. The viewer uses a PLY formatted file in the 3D viewer. A PLY formatted file must be defined in the file output filed. If multiple PLY files have been defined the user must select the desired ply file to use in the viewer.

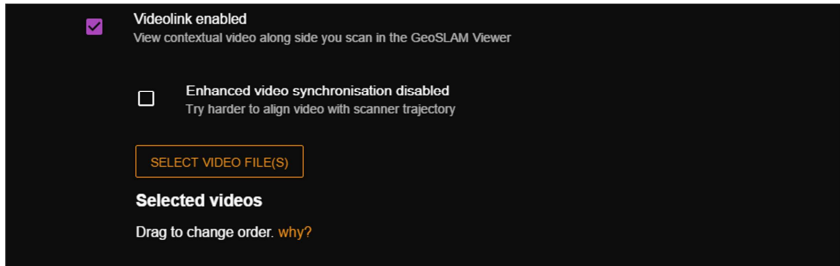
The viewer will generate simple “floor plan” views for each discernible floor that was scanned. These floor plans are generated primarily for use when displaying the contextual images generated from the ZEB-CAM video file but can also be used as a quick check for how well the data has processed.

Enable/Disable Videolink (default Disabled)

When the Viewer is enable an additional checkbox is provided for users who want to view the contextual images generated from the ZEB-CAM video – known as Video link.

When the Videolink checkbox is enables the user must select the ZEB-CAM video file(s) captured with the ZEB scan data. An additional checkbox is provided to enable/disable **Enhanced video synchronisation**. Enabling this feature will result in better synchronisation of the video images at the expense of significantly increased processing time.

Only check the *Videolink Enable* checkbox if you have a valid ZEB-CAM video file.



3.2 PROCESSING OPTIONS TAB

On the **Processing Options tab** users can change some of the processing parameters. Users can experiment with these parameter changes to try to improve datasets that do not process correctly with the default processing parameters:

Local Registration options	
Window size	Increasing this parameter cause the algorithm to take larger Samples of data for each processing step. This may help bridge slips that occur during the local registration phase. Increasing this parameter will increase the amount of memory required and the overall processing time. Range 0 to 5 (default 0)
Voxel density	Increasing this parameter cause the algorithm to use smaller voxels. This should enable more detail to be detected at close range and used during the SLAM processing. Increasing this parameter will increase the amount of memory required and the overall processing time. Range -1 to +3 (default 0)
Rigidity	Increasing this parameter will cause the algorithm to be more “rigid” during local registration phase. The algorithm will more influence by the raw IMU data and less influenced by laser point data when estimating the trajectory. Reducing this parameter has the opposite effect. The algorithm will be more influenced by the laser point data than the raw inertial data from the IMU Range -5 to +5 (default 0)
Bounding box	The user can change the default bound box used to eliminate the operator from the scan. All points inside the bounding box are ignored Increase the bound box size to eliminate more points around the scanner Reduce the bounding box if small spaces have been scanned
Process in reverse	This option will process the data set in reverse. This option can sometimes be used to fix data sets that do not process correctly in the forwards direction.
Conservative outlier pruning	By default the processing algorithm filters and discards outlier points, i.e. those points that do not appear to be part of a continuous surface. This enables so called “edge effect” points to be removed creating a cleaner data set. The filtering can remove points on thin objects such as overhead cables. The filtering can be made more conservative by enabling this feature.
End processing early	The user can specify an end time (in seconds) from the start. Only data up to this time is processed. This option can be

	used to recover part of a data set if an error occurs towards the end of the scan
Place Recognition	This feature will look for loop closures and pull them together during processing. This option can be used on large data sets where the drift during the SLAM processing causes loop closures not close properly. Only use this option if processing with it disabled results in loop closures failing to close.
Convergence threshold	Increasing this parameter increases the maximum number of iterations for each processing step and reduces the convergence threshold during the local registration phase. Increasing this parameter may fix some processing errors (at the expense of processing time) Range 0 to 5 (default 0)
Global Registration options	
Prioritise planar surfaces	Selecting this option will cause the algorithm to only match very planar surfaces during the global registration phase. This can help improve the global registration of very large data sets provided there are sufficient planar surfaces at point where there is loop closure
Start/finish closed loop	Uncheck this checkbox will force the start and end points to be pulled together before the start of the Global registration. The default for this setting is enabled. Disable this setting if the end of the scan is not in the same locations as the start.
Convergence threshold	Increasing this parameter increases the maximum number of iterations for each processing step and reduces the convergence threshold during the global registration phase. Increasing this parameter may improve the global registration (at the expense of processing time). Changing this parameter will not fix errors that occur during the local registration phase. Range 0 to 5 (default 0)
Rigidity	Increasing this parameter will cause the algorithm to be more “rigid” during global registration phase. The algorithm will more influence by the raw IMU data and less influenced by laser point data when estimating the trajectory. Reducing this parameter has the opposite effect. The algorithm will be more influenced by the laser point data than the raw inertial data from the IMU Range -5 to +5 (default 0)

4. GEOSLAM VIEWER

The GeoSLAM Viewer has two modes, 2D and 3D.

4.1 2D MODE

In 2D mode (Figure 4-1) an image of a horizontal slice from the point cloud at the height of the trajectory (floor plan) is presented. If multiple floors have been detected an image for is floor is presented. The user can cycle through the floors by clicking the + / - buttons in the top right corner of the display.

If a ZEB-CAM video file has been processed with the ZEB data, when the user clicks in the 2D view, images from the video file that are facing that point are displayed and the corresponding camera positions are displayed on the trajectory in the 2D view. The user can select a camera view and either drag it along the trajectory to see snap shots from video or double click to show/play the video from that camera position.

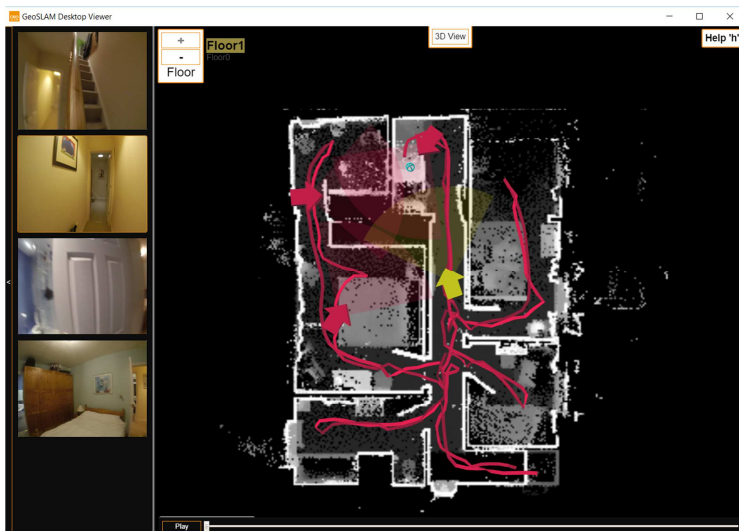


Figure 4-1

4.2 3D MODE

The user can switch to 3D mode by clicking the 3D View button at the top of the 2D display (or press the Tab key). The file displayed is the ply file you selected clicked the Enable Viewer checkbox. Depending on the size of the 3D file the 3D view may take some seconds to load.

The easiest way to navigate in the 3D view is to press the P key to lock the mouse and then use the keyboard arrow keys to zoom in and out and the mouse to turn left/right.

Press the H key to open the Navigation Help menu.

The following keys can also be used:

B – Toggles background colour from black to white

M – Cycles point size through 4 point sizes

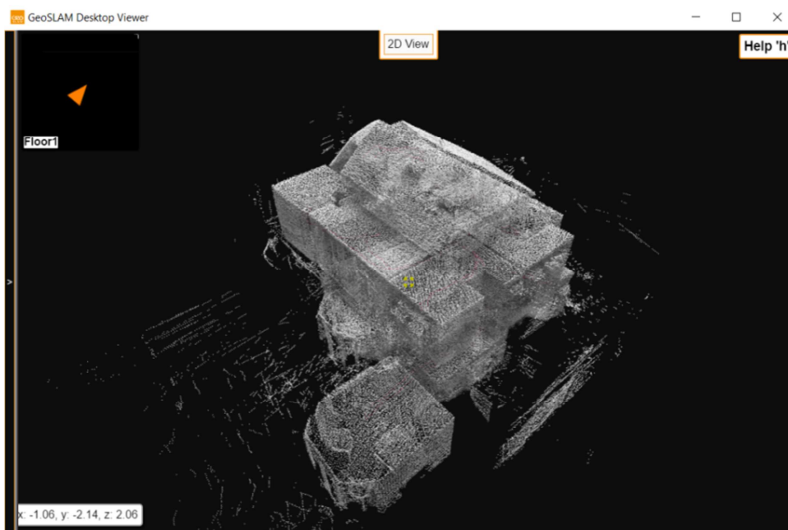


Figure 4-2

5. RESULTS FOLDER

The results folder contains the point cloud files selected on the Output Options dialogue page to prior to processing. Each file name is prefixed by the file name of the ZEB data set that has been process followed by descriptors defining the configuration of the file (Figure 5-1).

Option	Descriptor	Description
% of points	_%X	Where X is the percentage of points selected Omitted if set to 100%
Special decimation	_XXmm	Where XX is the spatial decimation selected Omitted if no spatial decimation selected
Point colour	_height _time _shade _cond _shape	Height coloured Time coloured Shaded coloured (ambient occlusion) SLAM condition coloured Shapecoloured Omitted if set to None
Timestamp	_ts _tss	World (UNIX) time timestamp Scan time timestamp Omitted if set to None
Normals	_norm	Normals included Omitted if set to None

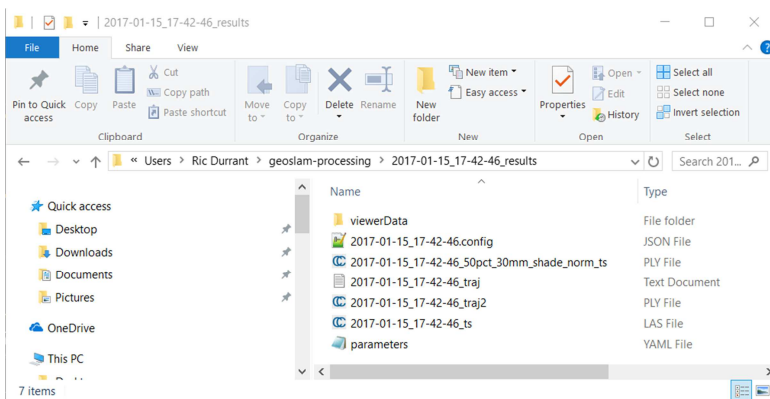


Figure 5-1

An ASCII txt file containing the scan trajectory is also written to the results file. The trajectory has the following data:

Column	Descriptor	Description
1	time	Time in UNIX time
2	x	Scanner x coordinate in metre relative to scan origin
3	y	Scanner y coordinate in metre relative to scan origin
4	z	Scanner z coordinate in metre relative to scan origin
5	q1	Orientation quaternion
6	q2	Orientation quaternion
7	q3	Orientation quaternion
8	q4	Orientation quaternion
9	Userfields	Currently unused

6. MORE FILES

Data sets processed in GeoSLAM Desktop V3.2 (or higher) can be reprocessed to generate different output files without having to run the full SLAM processing step. The More Files button against each data set can be used to select a different set of output file formats and specification (point colour, decimation, etc).

Click on the **MORE FILES** button (see Figure 6-1) and the File Output options dialogue box as described in Section 3.1 is displayed. Select the required output file configuration and click Process. The time taken to generate the new file configurations is a fraction of the time taken to run the entire SLAM processing step.

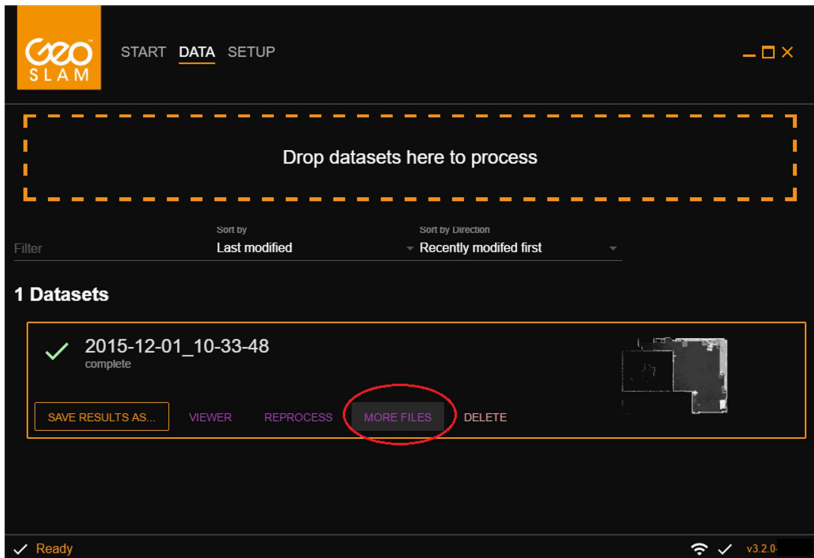


Figure 6-1

7. DATA SET MERGER

Data sets processed in GeoSLAM Desktop V3.2 (or higher) can be aligned and merged with other data sets using the Data Set Merger feature. This feature performs a non-rigid registration of two or more ZEB data sets.

The data set merger requires LAS formatted files with “World” time stamps (see Section 3-1). Files with this configuration are automatically generated irrespective of the output file configurations selected prior to processing.

A coarse alignment of the data sets must be performed manually prior starting the merge algorithm.

7.1 SELECTING DATA SETS TO MERGE

To start the data set merging process click the **MERGE** button on the top right of the DATA page as shown in Figure 7-1.

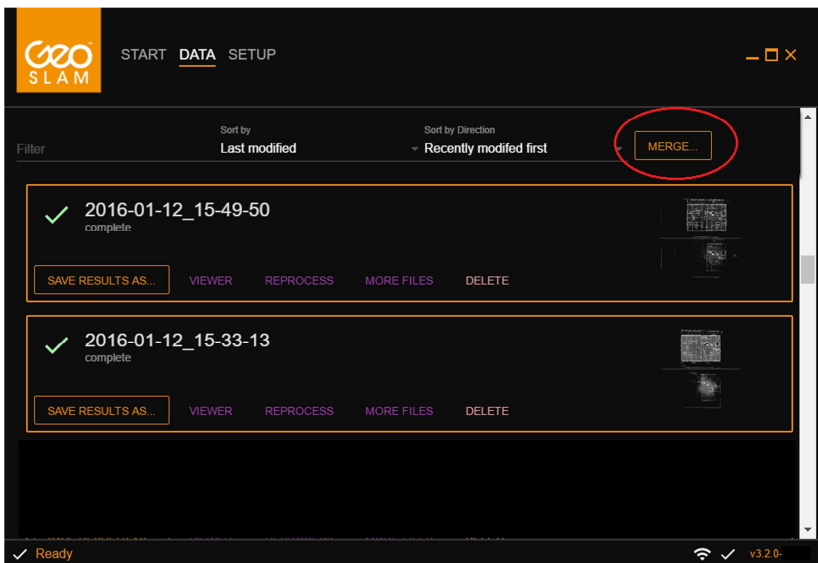


Figure 7-1

Data sets that have the requisite LAS file for merging will display a tick box next to them. Data sets processed in versions of GeoSLAM Desktop before V3.2.0 will not contain the requisite LAS file. The data sets will have to be reprocessed in order to generate the requisite LAS file. This file is automatically created in V3.2.0 irrespective of the file output options selected prior to processing.

Check the tick box next to the data sets you want to merge as shown in Figure 7-2 and click the **START MERGE** button.

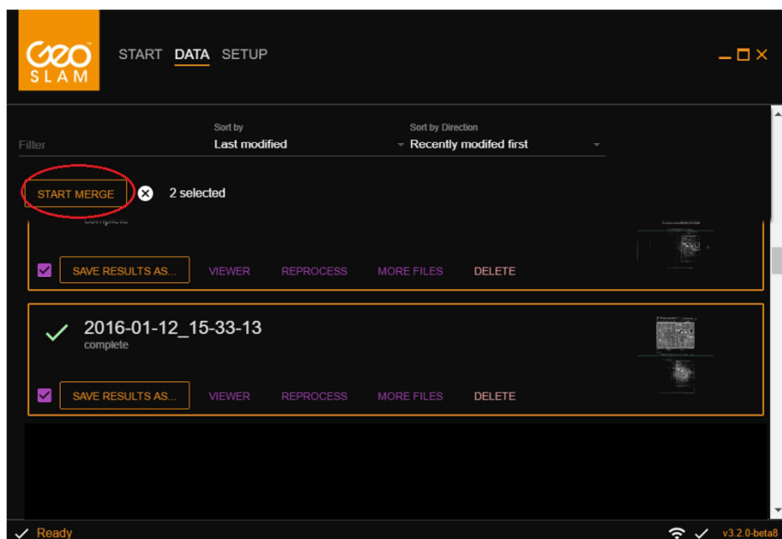


Figure 7-2

7.2 MANUAL COARSE ALIGNMENT

After clicking the START MERGE button a graphical display window is opened and the selected data sets are loaded in plan view as shown in Figure 7-3.

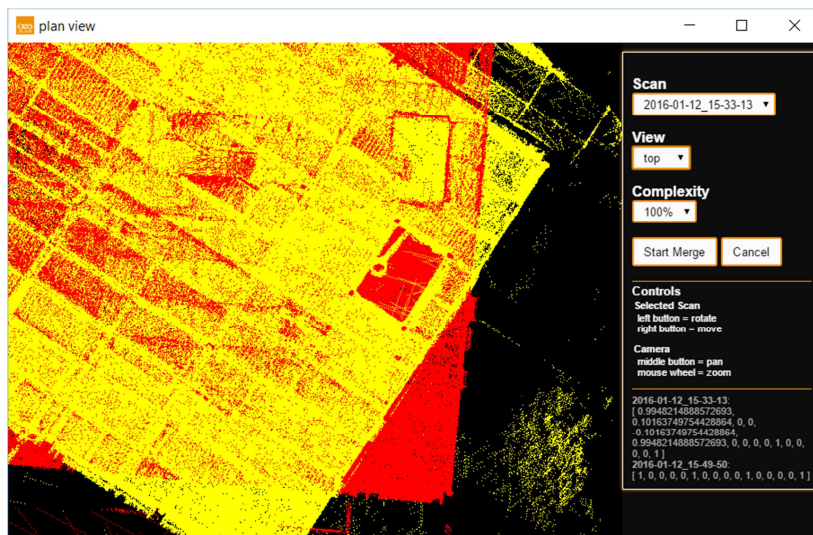


Figure 7-3

The currently active scan is shown in red. The other scans are shown in yellow. The name of the active scan is shown under the **Scan** heading in the information box (Figure 7-4). The other scans can be selected to become active by clicking on the drop down button adjacent to the scan name and selecting another scan from the drop down list.

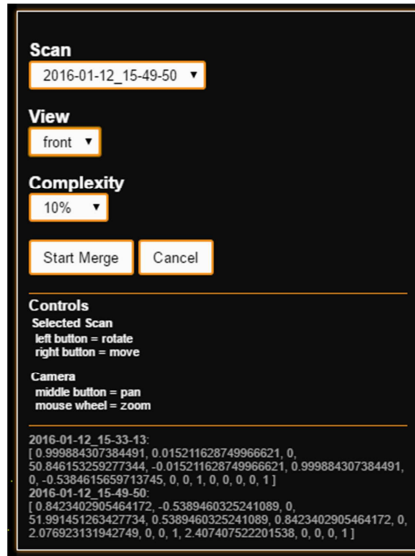


Figure 7-4

It is recommended that you open the merge graphics window to full screen.

For large data sets it is recommended the number of visible points is reduced using the drop down button against the **Complexity** setting (default 100%)

The currently active data set can be translated and rotated about the Z axis using the right and left mouse buttons respectively. The entire view can be zoomed in and out using the mouse scroll wheel and panned using the middle mouse button.

Translate and rotate the currently active (red) scan away from the others as shown in Figure 7-5.

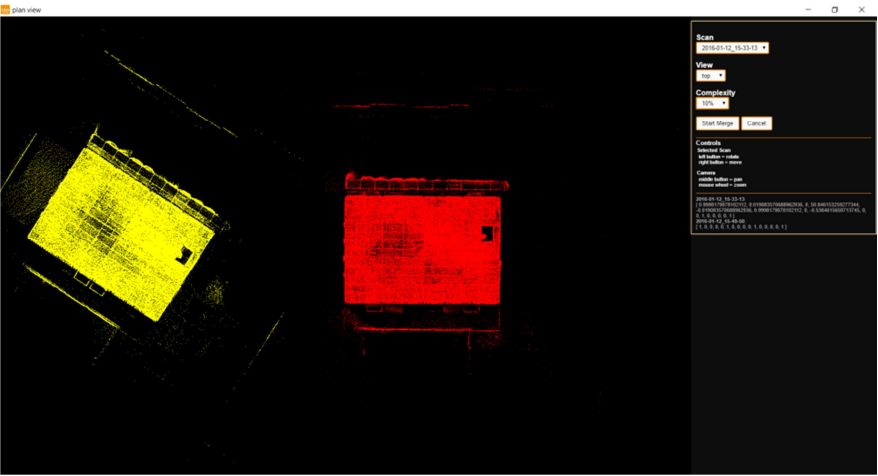


Figure 7-5

Select the next scan and translate and rotate to approximately align with the first scan as show in Figure 7-6.

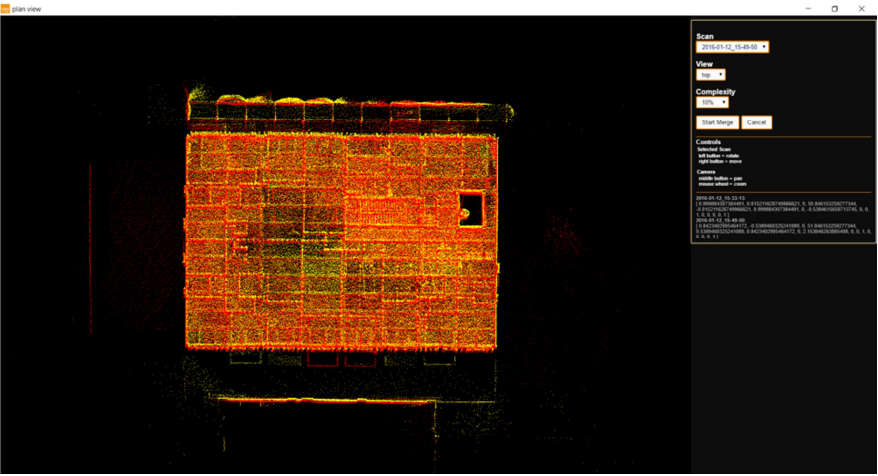


Figure 7-6

IMPORTANT! You must ensure the scans are approximately aligned vertically as well as horizontally. To do this click the **View** drop down button and select with Front or Side view. In these view only translation is enabled. Adjust the vertical position of the currently active to scan to approximately align with the first scan as shown in Figure 7-6.

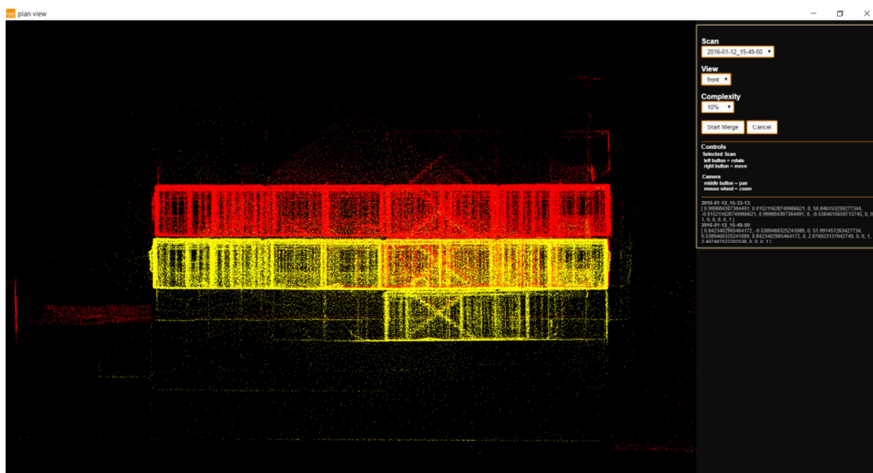


Figure 7-6

Repeat the coarse alignment for all data sets. Once all the data sets are coarsely aligned click the **Start Merge** button. The graphical display window will close and the merge algorithm will perform a non-rigid registration of the coarsely aligned data sets.

When the merge processing is complete a Save files dialogue box is displayed (Figure 7-7). Click Save and button and selected a file location to save the results folder. The default name for the results folder is **yyyy-mm-dd-hh-mm-ss_merge_results** where the date and time are the date and time the merge was performed. The results folder name can be changed prior to saving.

When the results have been saved a Save Complete dialogue is displayed from which the results folder can be opened.

The results folder contains separate “merged” LAZ files for each data set along with the modified trajectory for that data set in ASCII text format (see Section 5).

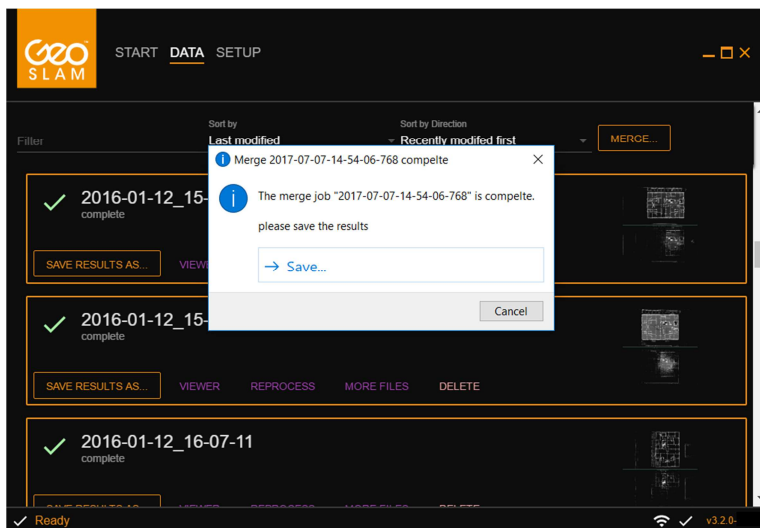


Figure 7-7

8. ADVANCED SETTINGS

8.1 SETUP PAGE

The SETUP page (Figure 8-1) provides an interface for:

- Manually updating the software
 - Here you can drag and drop update files which will install small updates to the Virtual Machine. This is not used often but is an alternative to a full Virtual Machine install.
- Switch on Automatic Updates (recommended)
 - Having automatic updates allows us to connect to both the software and the dongle to issue updates before components expire. This is particularly useful if you are using a distributor dongle.
- Download dongle update
 - In the case that a dongle update has been issued but has not applied you can force the update by using the download dongle update option.

Advanced options for

- Opening the processing folder (if request by the GeoSLAM support team)
 - In this processing folder, you will have your raw data files and your results folder. You will also have a config folder which is used during processing. This information enables the processing to work correctly so do not alter unless instructed to do so by GeoSLAM staff.
- Hardware calibration update
 - If you have a new install, your dongle has been reassigned or you have recently purchased a new unit you will need the correct calibration information. This information is usually found on the installation USB or is automatically downloaded once the dongle is read. If for some reason you are missing this information using hardware calibration update allows you to call the calibration information associated with your dongle from the servers.
- Resetting the software interface (only if request by the GeoSLAM support team)
 - Resets all settings top the factory install.
- Downloading the support log file (if request by the GeoSLAM support team)
 - Allows you to save a copy of your log file to send to GeoSLAM staff when instructed to do so.

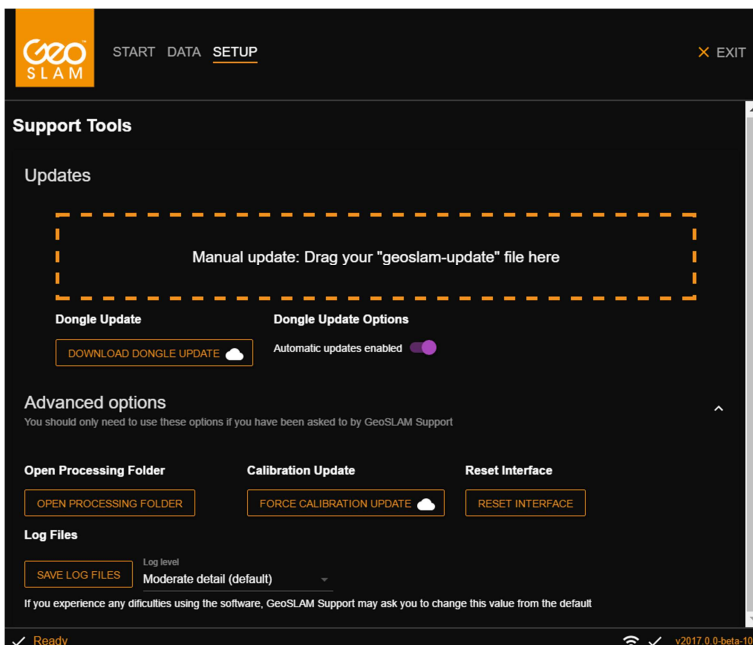


Figure 8-1

It should only be necessary to use this page if requested to do so by the GeoSLAM Support Team.

8.2 VIRTUAL MACHINE OPTIMIZATION

The GeoSLAM virtual machine running in VirtualBox can be optimized to make use of all of your machine's resources. You should only conduct optimization in consultation with the GeoSLAM Support Team.

The optimization process is carried out from the VirtualBox Manager window. To open the VirtualBox Manager, either click on the Oracle VM VirtualBox desktop icon or from the Oracle program group (search VirtualBox in the Windows start menus)

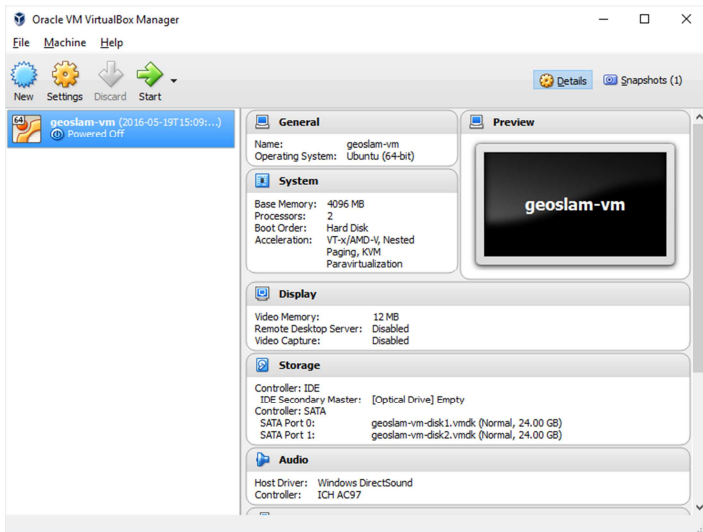
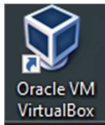



Figure 8-2

The **geoslam-vm** virtual machine must be “Powered Off” to enable optimization. To power the machine off, click *EXIT* on the top right of the GeoSLAM Desktop window.

Click on the snapshots icon in the top left of the VirtualBox manager window (Figure 8-2).

Select the snapshot and click on the “Delete” icon  to delete the snap shot (Figure 8-3)

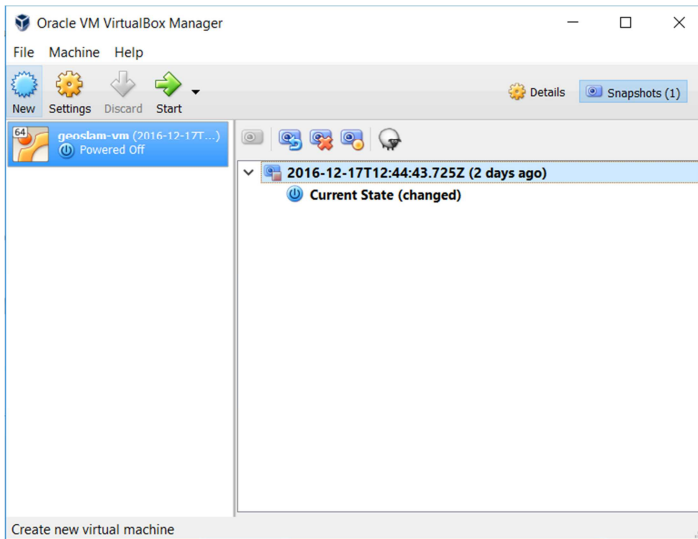


Figure 8-3

Click on the **Settings** icon in the toolbar and select **System** (Figure 8-4). To optimize the Base Memory, click and drag the blue slider to the furthest extent of the green range, without entering into the orange/red range (Figure 8-5).

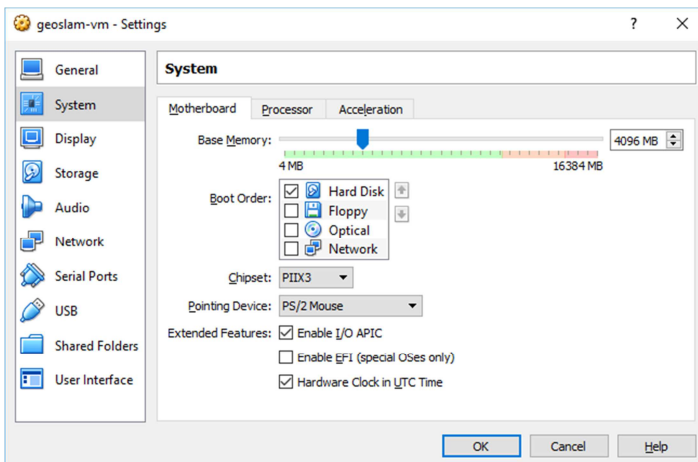


Figure 8-4

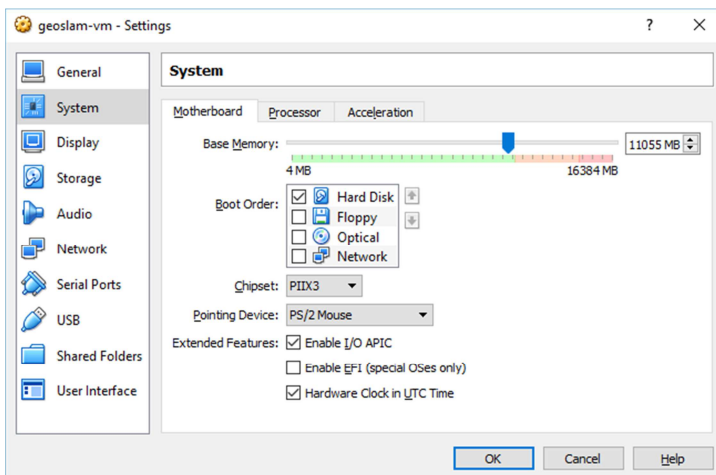


Figure 8-5

Next, click on **Processor** tab and optimise the number of Processor(s) used for processing by dragging the blue slider to the furthest extent of the green bar (Figure 8-6)

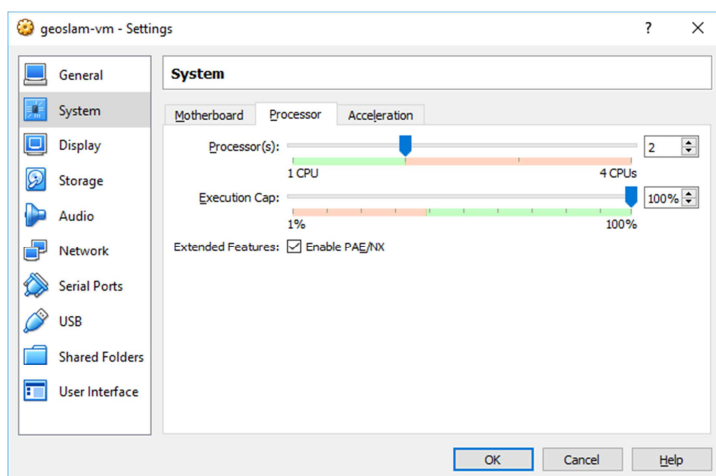


Figure 8-5

Once both the motherboard and processor have been optimized, click 'OK' to save the changes.

Restart GeoSLAM Desktop application either by clicking on the GeoSLAM desktop icon or from the GeoSLAM program group (search GeoSLAM Desktop in the Windows Start Menu).

8.3 FURTHER HELP AND INFORMATION

Contact GeoSLAM by any of the following methods:

Phone: +44 1949 831814

General email: info@geoslam.com

Support email: support@geoslam.com

Website: www.geoslam.com

GeoSLAM Limited

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- (d) exclude any liabilities that may not be excluded under applicable law,

and, if a party is a consumer, that party's statutory rights will not be excluded or limited by the EULA, except to the extent permitted by law.

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8.4 The Licensor will not be liable to the Licensee in respect of any loss of profits or anticipated savings.

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8.6 The Licensor will not be liable to the Licensee in respect of any loss of business, contracts or opportunities.

8.7 The Licensor will not be liable to the Licensee in respect of any loss or corruption of any data, database or software.

8.8 The Licensor will not be liable to the Licensee in respect of any special, indirect or consequential loss or damage.

8.9 The aggregate liability of the Licensor to the Licensee under this EULA shall not exceed the total amount paid and payable by the Licensee to the Licensor under the EULA.

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- (i) the breach is not remediable; or

- (ii) the breach is remediable, but the other party fails to remedy the breach within the period of 30 days following the giving of a written notice to the other party requiring the breach to be remedied; or
- (b) the other party persistently breaches the EULA (irrespective of whether such breaches collectively constitute a material breach).

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- (a) the other party:
 - (i) is dissolved;
 - (ii) ceases to conduct all (or substantially all) of its business;
 - (iii) is or becomes unable to pay its debts as they fall due;
 - (iv) is or becomes insolvent or is declared insolvent; or
 - (v) convenes a meeting or makes or proposes to make any arrangement or composition with its creditors;
- (b) an administrator, administrative receiver, liquidator, receiver, trustee, manager or similar is appointed over any of the assets of the other party;
- (c) an order is made for the winding up of the other party, or the other party passes a resolution for its winding up (other than for the purpose of a solvent company reorganisation where the resulting entity will assume all the obligations of the other party under the EULA);
- (d) if that other party is an individual:
 - (i) that other party dies;
 - (ii) as a result of illness or incapacity, that other party becomes incapable of managing his or her own affairs; or

- (iii) that other party is the subject of a bankruptcy petition or order.

9.3 The Licensor may terminate this EULA immediately by giving written notice to the Licensee if:

- (a) any amount due to be paid by the Licensee to the Licensor under the EULA is unpaid by the due date and remains unpaid upon the date that that written notice of termination is given; and
- (b) the Licensor has given to the Licensee at least 30 days' written notice, following the failure to pay, of its intention to terminate the EULA in accordance with this Clause 9.3.

10. Effects of termination

10.1 Upon the termination of this EULA, all of the provisions of this EULA shall cease to have effect, save that the following provisions of this EULA shall survive and continue to have effect (in accordance with their express terms or otherwise indefinitely): Clauses 1, 3.1, 8, 10, 11 and 12.

10.2 The termination of this EULA shall not affect the accrued rights of either party.

10.3 For the avoidance of doubt, the licences of the Software in this EULA shall terminate upon the termination of this EULA; and, accordingly, the Licensee must immediately cease to use the Software upon the termination of this EULA.

10.4 Within 10 Business Days following the termination of this EULA, the Licensee must:

- (a) return to the Licensor or dispose of as the Licensor may instruct all media in its possession or control containing the Software; and
- (b) irrevocably delete from all computer systems in its possession or control all copies of the Software.

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- 11.3 This EULA may not be varied except by a written document signed by or on behalf of each of the parties.
- 11.4 Neither party may without the prior written consent of the other party assign, transfer, charge, license or otherwise deal in or dispose of any contractual rights or obligations under this EULA.
- 11.5 This EULA is made for the benefit of the parties, and is not intended to benefit any third party or be enforceable by any third party. The rights of the parties to terminate, rescind, or agree any amendment, waiver, variation or settlement under or relating to this EULA are not subject to the consent of any third party.
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- 11.7 Subject to Clauses 8.1 and 11.6, this EULA shall constitute the entire agreement between the parties in relation to the subject matter of this EULA, and shall supersede all previous agreements, arrangements and understandings between the parties in respect of that subject matter.
- 11.8 This EULA shall be governed by and construed in accordance with English law.
- 11.9 The courts of England shall have exclusive jurisdiction to adjudicate any dispute arising under or in connection with this EULA.

12. Interpretation

- 12.1 In this EULA, a reference to a statute or statutory provision includes a reference to:

- (a) that statute or statutory provision as modified, consolidated and/or re-enacted from time to time; and
 - (b) any subordinate legislation made under that statute or statutory provision.
- 12.2 The Clause headings do not affect the interpretation of this EULA.
- 12.3 In this EULA, general words shall not be given a restrictive interpretation by reason of being preceded or followed by words indicating a particular class of acts, matters or things.