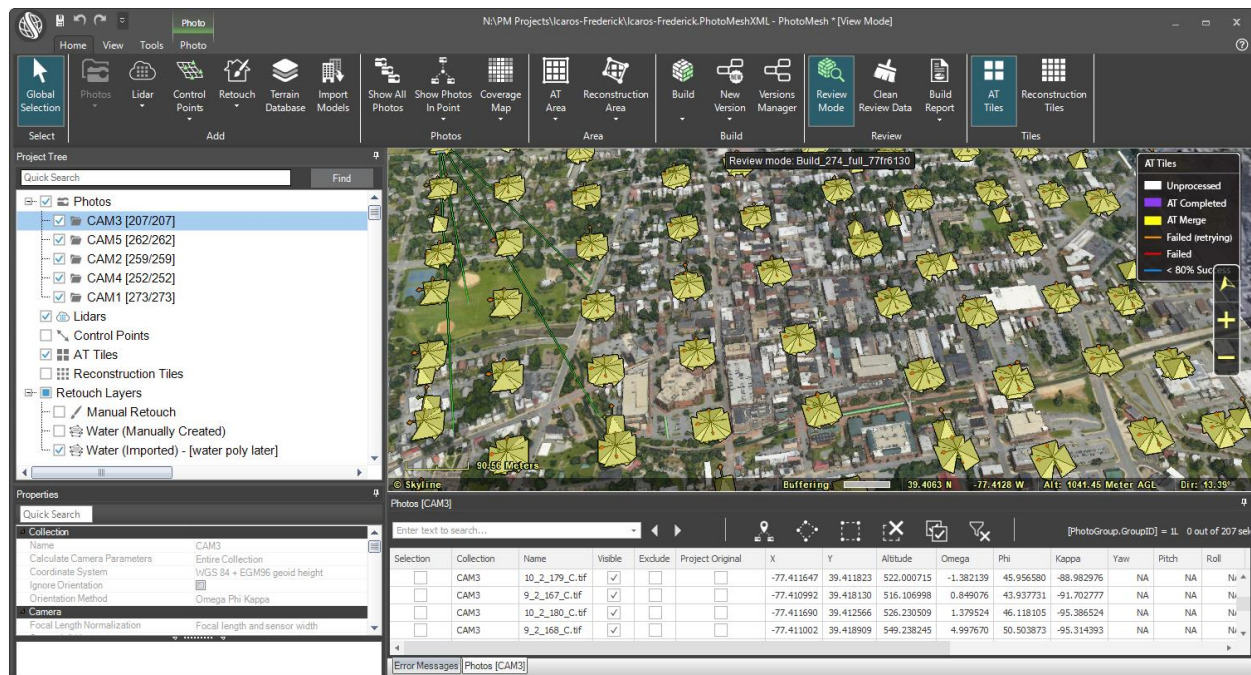


RELEASE NOTES FOR PHOTOMESH 7.7

About PhotoMesh

Skyline's PhotoMesh application fully automates the building of high-resolution, textured, 3D mesh models from oblique and nadir photographs and Lidar captured from street view, drones, UAV and airplanes. PhotoMesh's breakthrough technology is based on the highest-performance photogrammetry, computer vision, and computational geometry algorithms. PhotoMesh offers a range of output options including standard 3D model (3DML, OSGB, DAE, OBJ), raster (Orthophoto, DSM, DTM) and point cloud (LAS) formats. PhotoMesh's 3DML format can be transformed into powerful geospatial data that fully supports spatial operations and attribute queries, by loading it into TerraExplorer and merging it with classification information. All supported formats can be published from TerraExplorer Pro to SkylineGlobe Server for viewing in Skyline 3D viewers (TerraExplorer for Desktop, TerraExplorer for Web and TerraExplorer for Mobile) and 3rd party viewers (Cesium, ESRI, etc.).



Quality Enhancements

- Better handling of close-range projects:
 - Photo matching step prioritizes features close to the camera in the bundle adjustment to improve aerotriangulation results in close-range projects (Implemented using "AT foreground object at close range" preset).
 - Sharpens thin objects such as poles and wires by cleaning point cloud noise around their edges (Implemented using "Reconstruction ground-based LIDAR and projects with tall structures" preset).
 - Cleans sky background from photos looking at the horizon (Implemented using "Reconstruction sky background clean" preset).



- Improved build results in low overlap, nadir projects – Fills in ground gaps in areas with low coverage (e.g., to sharpen building outlines and fill holes in the ground) by incorporating calculated ground surface (Implemented using "Reconstruction fill in ground" and "Reconstruction fill in ground and add walls" presets. Can be used together with the "Reconstruction mesh vertical bias" preset).



- Improved color balancing – Enhances contrast of project photos using a Contrast Limited Adaptive Histogram Equalization (CLAHE) algorithm (Implemented using the “DataPrep local_brightness histogram correction for images (CLAHE)” preset. Other preset options include " DataPrep brightness histogram correction for images" and “DataPrep color histogram correction for images”).
- Optimized mesh and texture quality
 - Sharper mesh edges and more triangles in areas of complex topology.
 - Fewer triangles in flat areas, which results in cleaner geometry and reduced file size and processing time.
 - Optimized mesh triangle count for each of the model’s levels of detail (LOD) produces a more accurate mesh in different viewing distances.
- Better support for multi-band projects
 - Provides the ability to select one or more bands for orthophoto texturing and any three bands for mesh model processing.
 - Improves color balancing for multi-spectral bands (NIR, thermal) by minimizing color artifacts.
 - Optimizes texturing algorithm performance by restricting texture generation to only bands that are in use.



- Improved DSM quality – Smooths mesh model triangle artifacts when generating DSM raster output.
- Improved control point use in aerotriangulation algorithm – Ground control and tie points are now assigned a stronger weight when performing aerotriangulation, to increase geographical accuracy in projects with unreliable inputted camera positions.

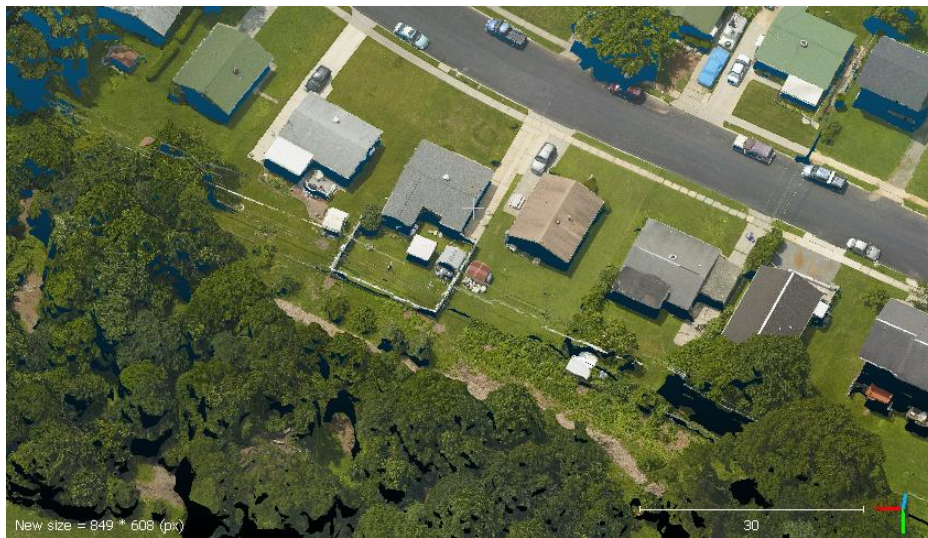
- Improved Lidar textures – Improvements to Lidar color-based textures by applying a color smoothing algorithm.
- Clean texture artifacts

Expanded Input and Output Support

PhotoMesh 7.7 offers expanded input and output options, including all the following:

Outputs:

- New DSM to LAS tool exports the Digital Surface Model (DSM) output as colored point cloud model in LAS or LAZ format.



- OBJ and DAE output models are now saved with single texture file per tile.
- Enhanced options for orthophoto and Digital Surface Model (DSM) outputs:
 - Ability to define tile size in pixels.
 - Ability to define grid origin.
 - Ability to define tile overlap in pixels.
 - Default coordinate system for all raster outputs changed to the local UTM zone in project area.
- Aerotriangulation and reconstruction tile polygons saved as part of a project's outputs.
- Raster output (orthophotos, DSM & DTM) TIFFs can be saved as LZW lossless compression or as jpg compression.

Raster

☒ Orthophoto

Resolution: ☒ Auto 0.015 meters per pixel

Image Quality: ☒ Compressed 99 %

Image Size: 8192 pixels

Overlap Between Images: 0 pixels

Texture Blending: Extra

Photo Priority: Nadir direction

No-data Color: Black

Bands and Collections: Red, Green, Blue [4/4 Collections] ...

Grid Origin: ☒ Auto X: Y:

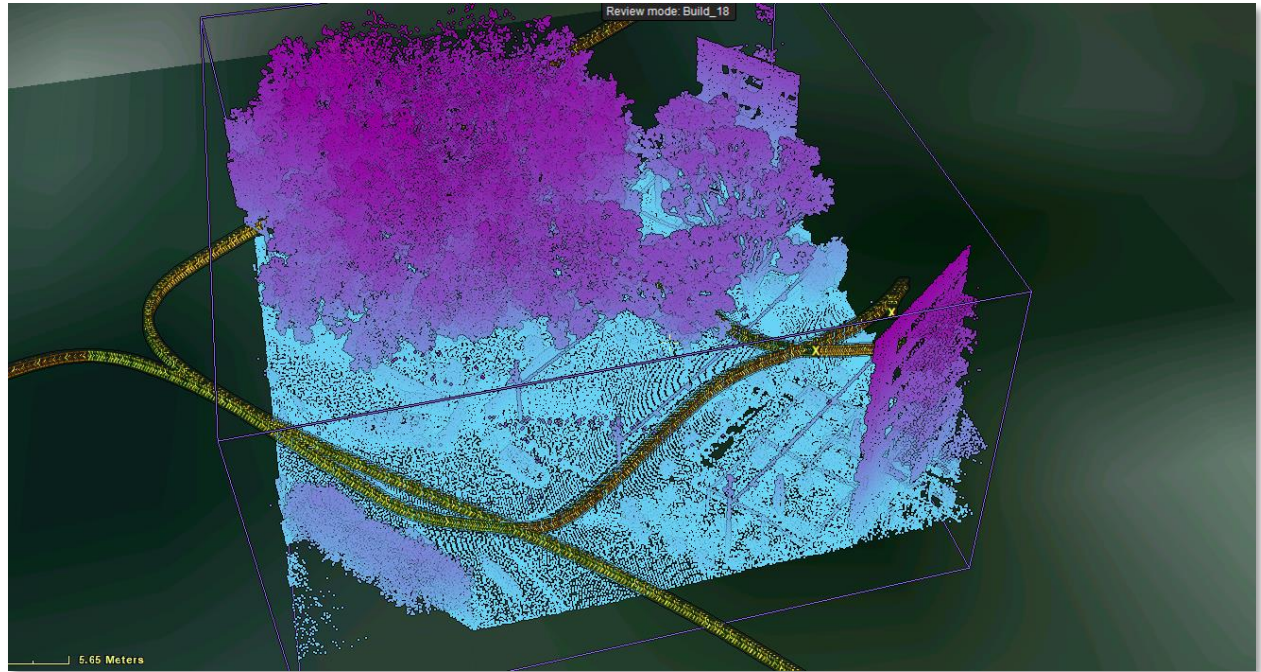
Inputs

- Fully support photo orientation in yaw/pitch/roll format.
- Support reading photos directly from Amazon S3 buckets and behind HTTP servers (*not supported by the Gigapixel mechanism).
- CSV/Text loader – Photo and photo collection information (e.g., sensor width, focal length, and aerotriangulation data) can now be loaded from a CSV file.
- Phase One – Read raw photos created by Phase One sensors.

Lidar Improvements

PhotoMesh 7.7 features enhancements to Lidar display and functionality. Lidar data can be integrated with project photos to supplement project data and increase model accuracy.

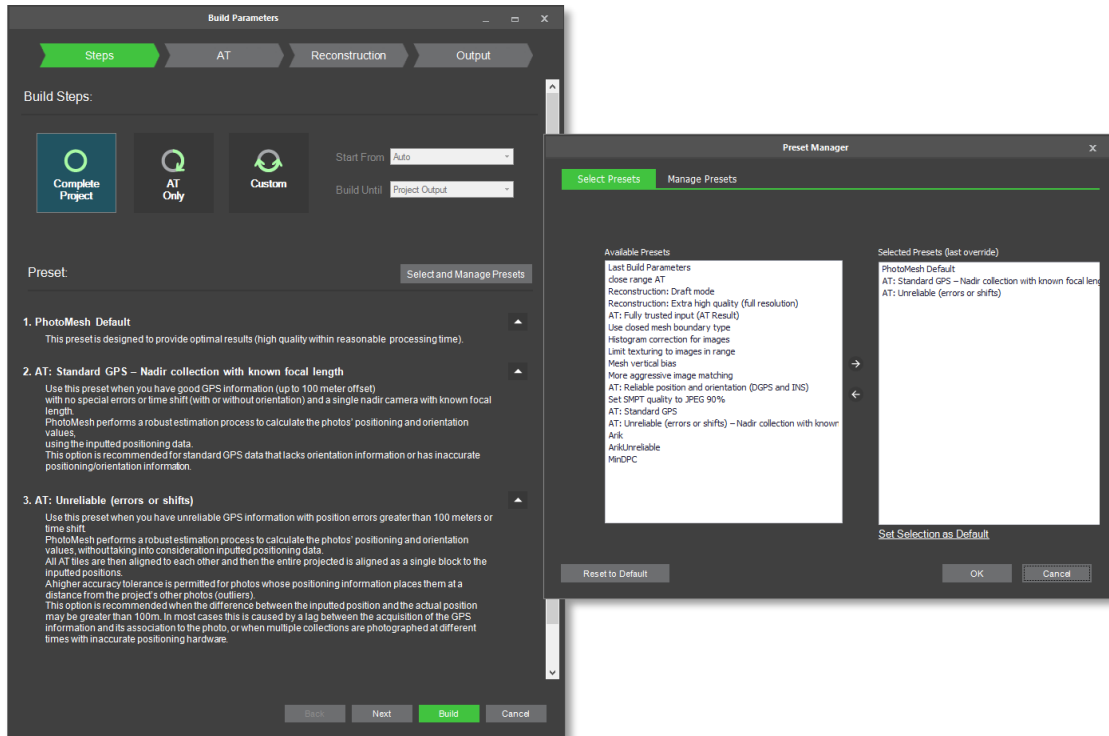
- Point cloud styling – Set point size, color and visibility based on point cloud attribute information.
- Manage Lidar sources in a sortable, multi-edit list.
- Display the Lidar's trajectory in the 3D Window.
- Lidar files can now be loaded even after aerotriangulation is performed. If reconstruction had already started, all reconstruction tiles that intersect with the new Lidar's bounding box are rebuilt automatically in the next project build.
- Change Lidar coordinate system and automatically reconvert and import these Lidar files in the next project build.



Preset Mechanism

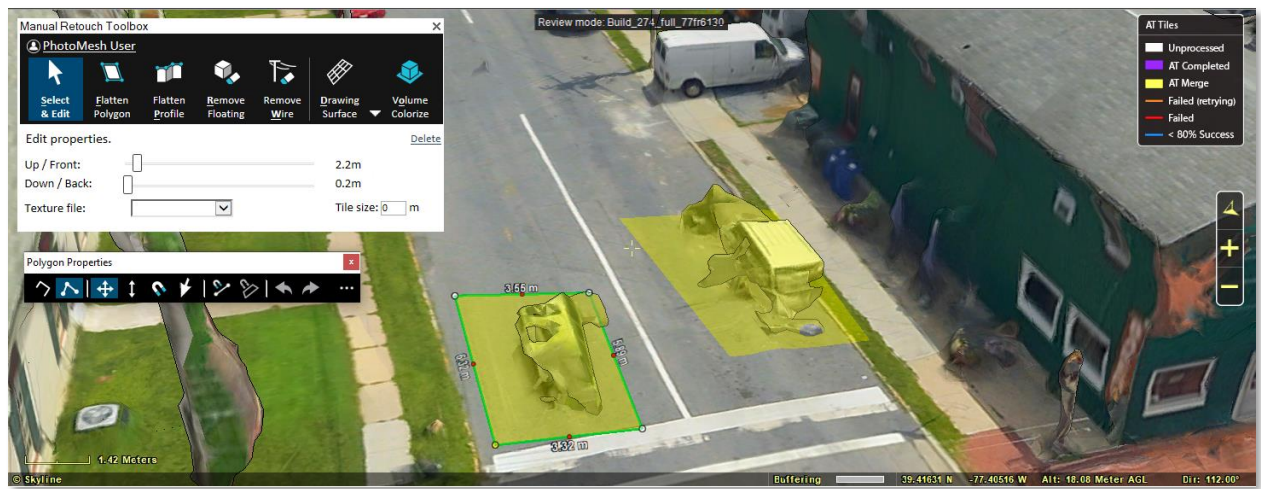
PhotoMesh's build-preset mechanism has been enhanced to allow saving of only specific build settings as a preset, loading of multiple presets, and more. The preset mechanism makes it easy to automatically set the required parameters to generate the optimum output for the project's data as well as to share user-defined build settings between projects.

- Presets now include only changes from the default settings.
- Users can control which step settings are saved (AT/ Reconstruction/ Output/ CS), so only changes to these steps are saved and loaded.
- Multiple presets can be selected for a build, each of which defines settings for a different subset of the build steps. If selected preset files have conflicting properties or flags, the value from the last file on the list is applied.
- New set of presets for different use cases (close range, optimization for special output formats and more).
- GUI improvements include detailed descriptions of the selected presets, selection control to multi-select presets for a project, and powerful management control to load, edit and delete presets.



Manual Retouch

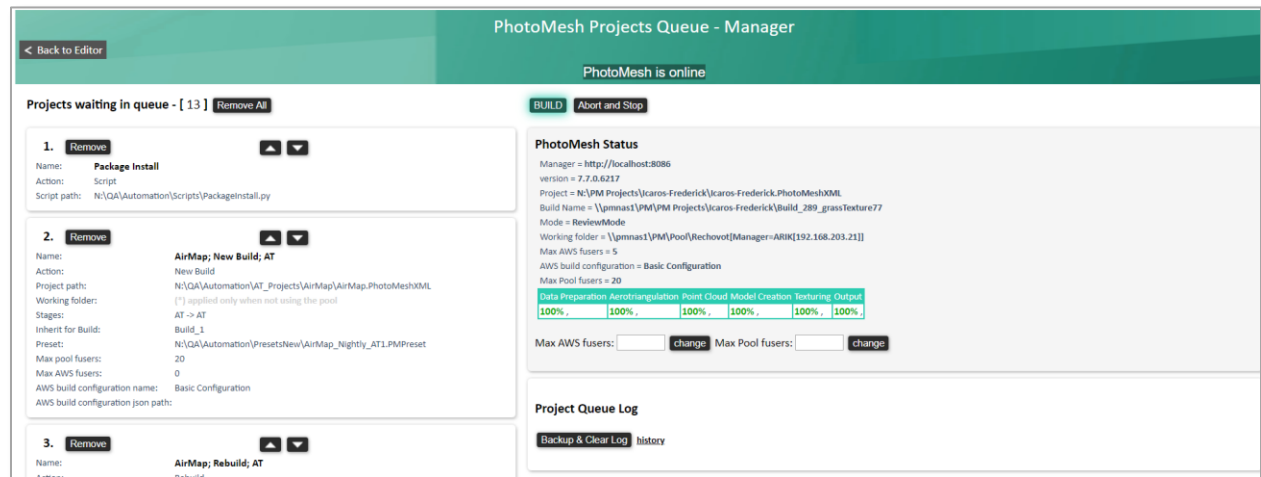
Mesh imperfections, such as bumps, irregular surfaces, or floating artifacts, can be flattened, filled, and cleaned up directly in PhotoMesh using the Manual Retouch tool. This tool performs smart selection, taking your rough marking of floating artifacts, wires, or surfaces for flattening, analyzing the pixels, and determining the object it thinks you want within the rough selection. You can then further modify the selection polygon and adjust the applied buffers. The output of the Manual Retouch tool is a polygonal feature layer with attribute information that defines what retouch action should be performed in each area: clean, flatten, and retexture. When rebuilding the project, PhotoMesh uses the manual retouch layer to add a set of constraints to the reconstruction algorithms, that are applied when the mesh model is rebuilt..



Project Queue

Improvements to the Project Queue automation mechanism. The Project Queue is a REST API to create a project queue, and then activate, monitor, and manage the queue processing.

- New script step type (python,JS) to analyze and manages the outputs of the queue processing.
- New pause step type to pause a build so the user can inspect the result and add control/tie points and then resume the process.
- Ability to load multiple presets, and support full path name for the preset location.
- Ability to sort the queue.

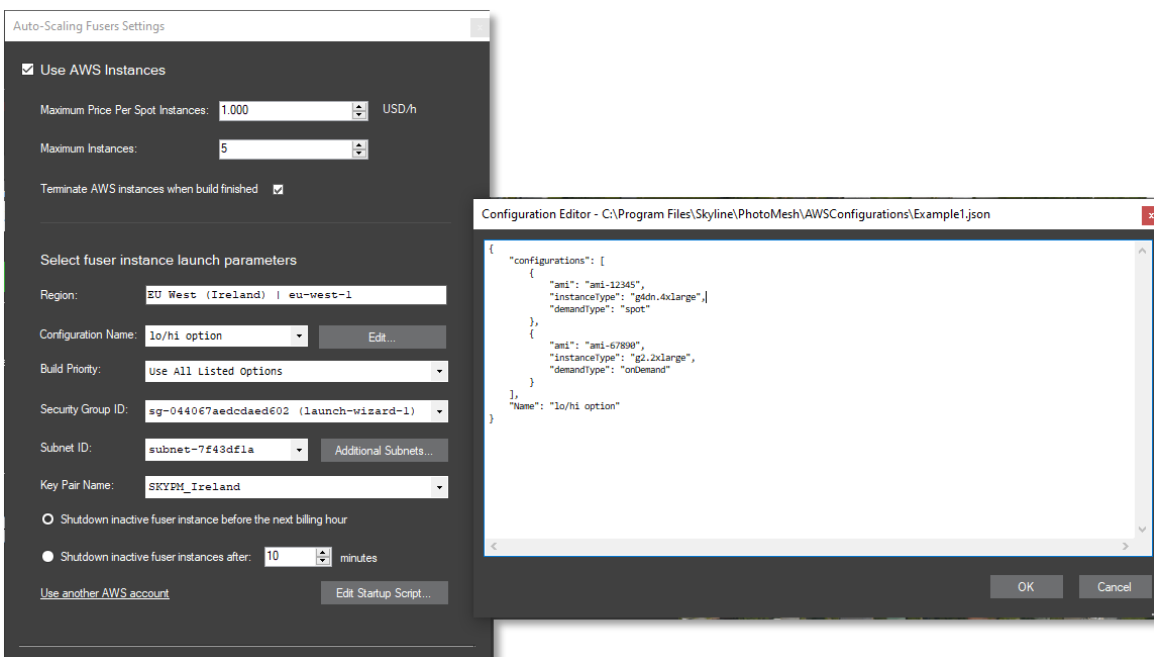


AWS and Cloud Automation

Improvements to the AWS fusers management mechanism to optimize your cloud resources:

- Increased options for defining fuser allocation allow you to select the most cost-effective fuser solution for your build processing needs and steps. You can now define the instance type, AWS zone, Spot/On-Demand allocation type and even use GPU machines only when needed.

- Support for instance startup script to dynamically allocate cloud resources needed for the build process (disk mount)
- Better management of your cloud costs and reporting by supporting AWS tags by your manager and fuser instances.



Usability Enhancements

New Item List

The Item List provides a powerful and efficient method of viewing information about and working with the items in a Project Tree group: photos, Lidar, reconstruction tiles, AT tiles, manual retouch layers, manually created water polygons and every imported water polygon layer. You can easily perform a textual or geographic search of the list to find and select the item you need, and then perform a wide range of actions on the item using an easy-to-access right-click menu or ribbon commands.

Photos [CAM3]

Enter text to search...

Selection	Collection	Name	Visible	Exclude	Project Original	X	Y	Altitude	Omega	Phi
<input type="checkbox"/>	CAM3	15_2_285_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.416882	39.416324	535.898937	6.400739	-36.38894
<input type="checkbox"/>	CAM3	13_2_247_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414755	39.418086	535.498560	-1.023941	40.11156
<input type="checkbox"/>	CAM3	15_2_284_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.416879	39.415516	534.623305	5.452428	-34.35664
<input type="checkbox"/>	CAM3	13_2_246_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414710	39.417290	537.020968	1.100079	41.51492
<input type="checkbox"/>	CAM3	13_2_245_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414698	39.416528	538.517392	4.143940	43.33769
<input type="checkbox"/>	CAM3	15_2_283_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.416841	39.414760	533.113796	2.464684	-40.53046
<input type="checkbox"/>	CAM3	13_2_243_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414675	39.414966	543.133684	4.388038	44.92065
<input type="checkbox"/>	CAM3	13_2_242_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414644	39.414151	545.484226	0.148243	42.46196
<input type="checkbox"/>	CAM3	13_2_241_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.414649	39.413325	546.097707	4.529484	42.35891
<input type="checkbox"/>	CAM3	15_2_280_C.tif	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-77.416645	39.412399	532.392554	-1.267799	-45.34305

Enhanced Selection Tools

PM 7.7's new point, polygon, and rectangle selection commands provide expanded options for selecting items in 3D Window by geographic location



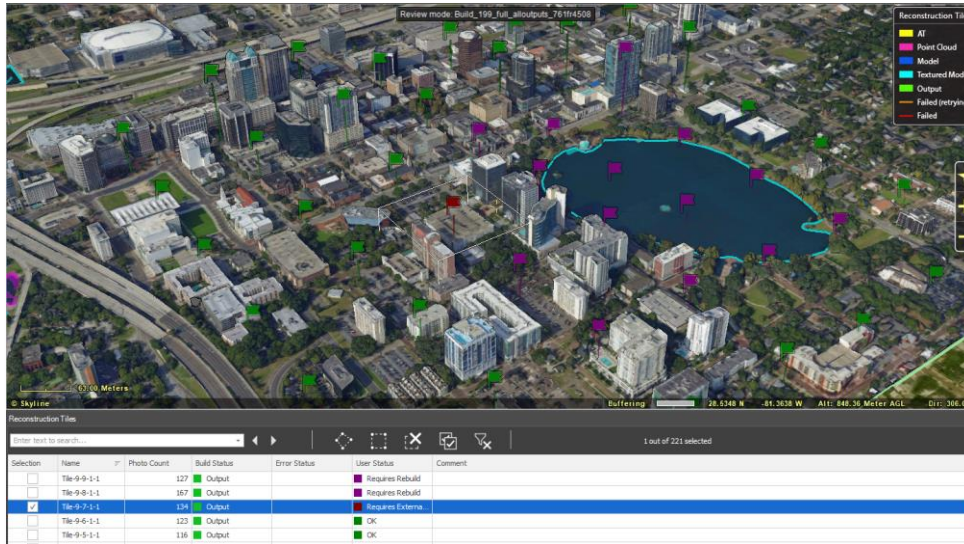
3D Tile Selection Modes

New 3D tile selection modes allow you to view and inspect your project's 3D mesh layer output while selecting the underlying AT and Reconstruction tiles.



Tiles User-Status Mechanism

Using the new tile's user-status mechanism, user can inspect, and tag AT and reconstructions tiles using a set of colored flags and add free-text comments. Tiles can be sorted and filtered using these user-status tags for additional operations (rebuild, manual retouch, export and more).

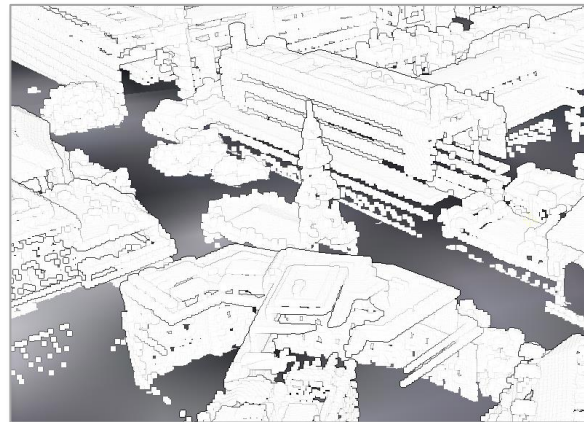
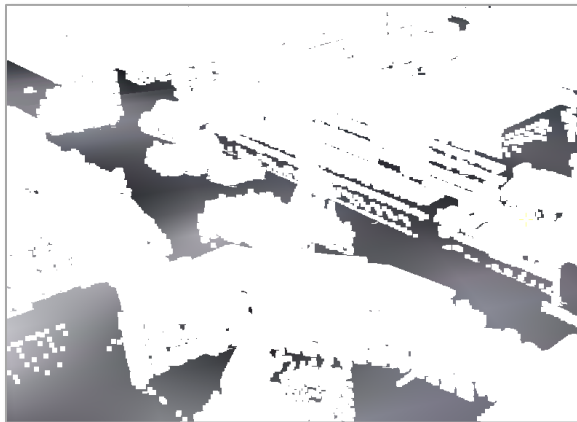


Cursor Selection Modes

New "List" selection mode limits your selection to the item type of the List currently open, making it easier to select the precise item you want in the 3D Window, e.g., if you want to select a tile when the Tile List is open, clicking on a camera icon that is somewhat concealing your tile, will still select the tile below it. You can easily toggle between List selection and Global selection, which selects whatever PhotoMesh item you point to in the 3D Window.

Depth Perception Mode

Highlight depth changes in the 3D model to make it easier to recognize the model's contours and shape. This can be particularly useful for an untextured model or point cloud without colors.

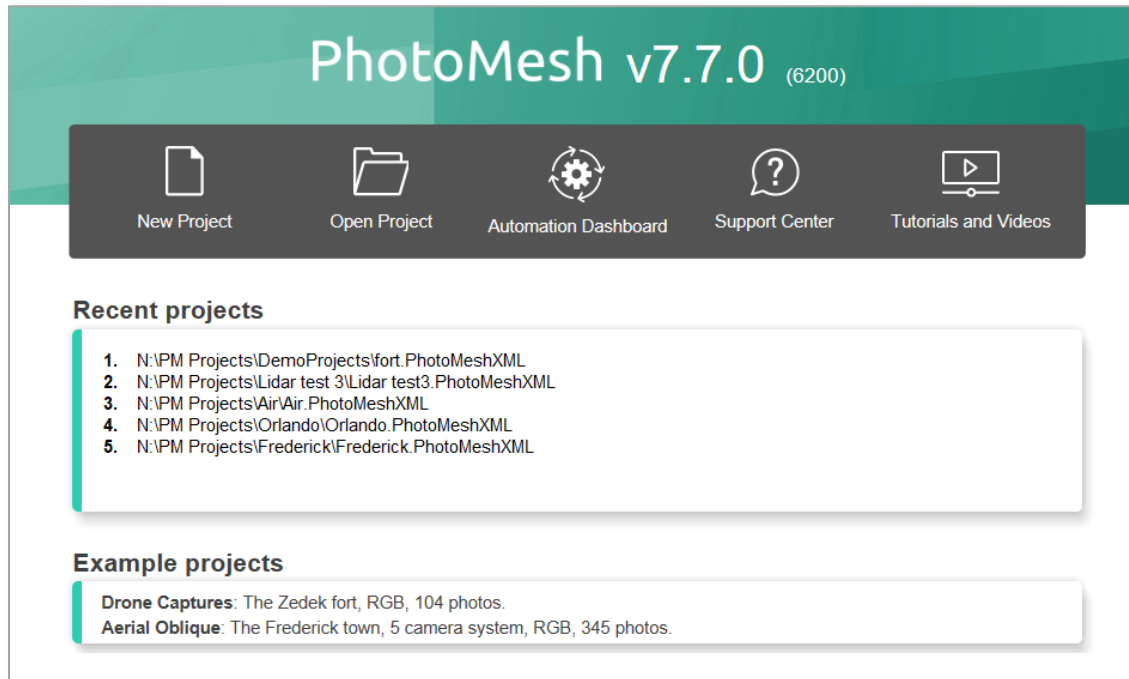


Drag and Drop

New drag and drop capability let you easily open a new project or load photos, Lidar, control points, and video files.

New PhotoMesh Start Page

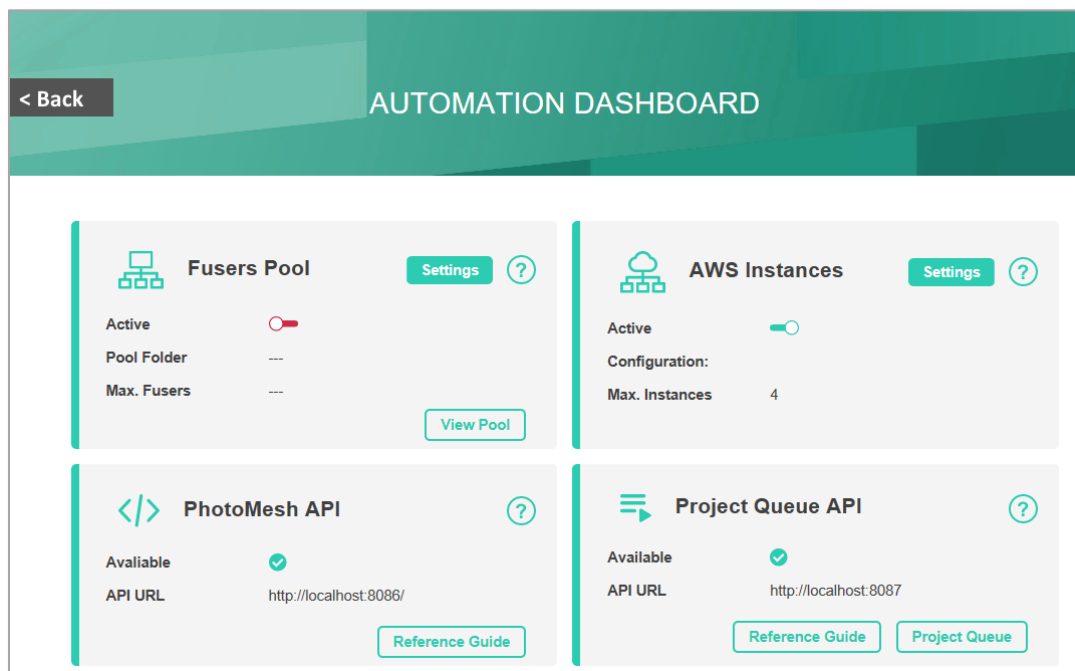
The new Start page makes it easy to access recent projects, training materials, videos, demo projects and more.



New Automation Dashboard

The Automation Dashboard consolidates all your PhotoMesh automation capabilities and documentation in one, easy-to-access place:

- **Fusers Pool** – Monitor and manage your fusers pool. The fusers pool is used to share fusers between several PhotoMesh master computers in your organization, using a distributed management approach.
- **Amazon Web Services (AWS) Instances** – Monitor and manage your AWS instances. PhotoMesh can work with Amazon Web Services to scale project production up and down based on resource needs. AWS fuser spot instances can be dynamically launched whenever there are unassigned pending fuser tasks, to further accelerate model creation.
- **PhotoMesh API** – View interactive documentation of the REST API for PhotoMesh Production. This API can be used to automate the production phases, e.g., load photo files or list, set AT and reconstruction areas, begin and manage a build, and create new build versions.
- **Project Queue API** – View technical and interactive documentation of the REST API for project queues and open the Project Queue Manager. The Queue API can be used to create a project queue and then activate, monitor, and manage queue processing.



SOFTWARE AND HARDWARE REQUIREMENTS

Operating System	Windows® 8 / 10, Windows® Server 2012 R2 / 2016 / 2019 – 64-bit required. Ubuntu 18.04 and Debian 10.0 – 64-bit required (Only for PhotoMesh fusers).
System Memory	16 GB RAM (32 GB recommended).
Video Card	1 GB of video memory (2 GB or more recommended). Pixel and vertex shader v3.0.
Processor	4 cores (8 cores recommended). PhotoMesh works best in a multi-core environment and can utilize multiple CPU's and hyper-threaded processors.
Additional Software	.Net Framework 4.6 required.