TELEDYNE OPTECH
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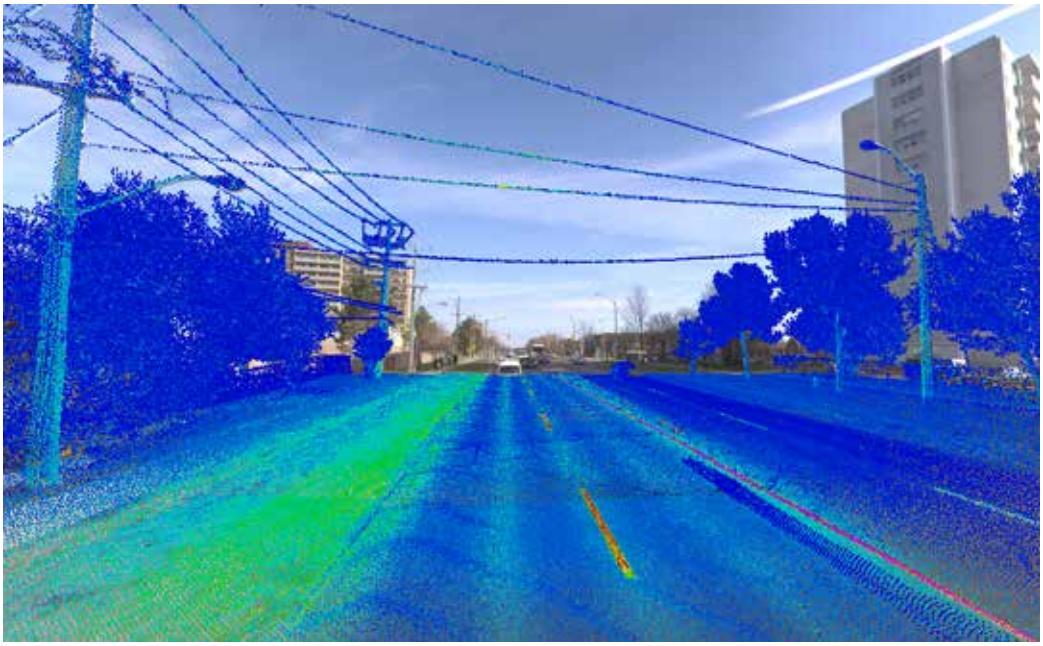
# Optech LMS

Mobile applications

## Lidar Mapping Suite - Professional

## Key Features

- Integrated processing for lidar/camera sensors
- Quality assurance processes for optimal accuracy
- Quality control tools for efficient and robust project validation
- Designed for commercial production processing



Optech LMS integrates both lidar and image sensor processing methods into a single workflow platform, enabling comprehensive sensor calibration and accuracy quantification

## Lowering the Cost of Survey-Grade Mobile Data in Difficult Environments

The processing and output of accurate point cloud/imagery data can be the most expensive component of a mobile lidar survey. Efficiency is crucial to overall project success when generating verifiably accurate data suitable for detailed information extraction, especially in projects with stringent accuracy requirements and often volatile GNSS conditions.

Optech LMS  is a comprehensive data processing platform for calibration, boresight and accuracy quantification of mobile data. Designed to serve as a single central processing hub of raw lidar and image data, LMS employs powerful least-squares algorithms with batch processing methods and the latest in distributed and multi-threaded processing routines to automate sensor calibration, compute project-wide accuracies, and maximize data throughput. Embedded data quality assurance and control tools enable you to comprehensively optimize and validate the accuracy of your data—without the need for external toolsets.

## LMS for Quality Assurance

Proper sensor calibration is a pre-requisite for maximizing the accuracy of data and map products, as well as for ensuring proper multi-sensor integration. LMS leverages the following key principles in its fundamental approach to sensor calibration and quality assurance, including planar surface extraction of redundant features, rigorous, industry-accepted methods for automatic sensor calibration, and the generation of reliable and repeatable sensor corrections:

- Data redundancy
- Rigorous methodology
- Reproducible results

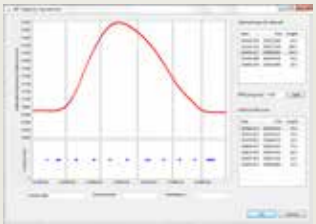
## Self-Calibration Engine

The self-calibration engine in LMS Pro is based on over a decade of research and development and represents a breakthrough for lidar system calibration. It incorporates complex sensor optical models and advanced least-squares algorithms that estimate reliable and repeatable corrections to lidar system calibration parameters (e.g., sensor and boresight parameters) and measurements (e.g., trajectory position and orientation).

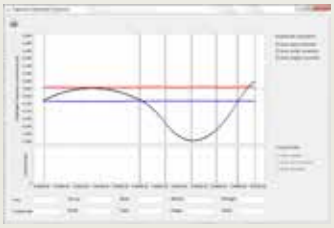
### Robust Trajectory Optimization

The major challenge for mobile survey systems is determining the trajectory position in the presence of GNSS outages. LMS Pro's key features for trajectory optimization include:

- Algorithm for meaningful trajectory segmentation based on GNSS quality
- Sophisticated error modeling to ensure an integrated solution



Automated trajectory segmentation based on GNSS quality – Interface enables manual editing of segments and visualization of control points (blue points)

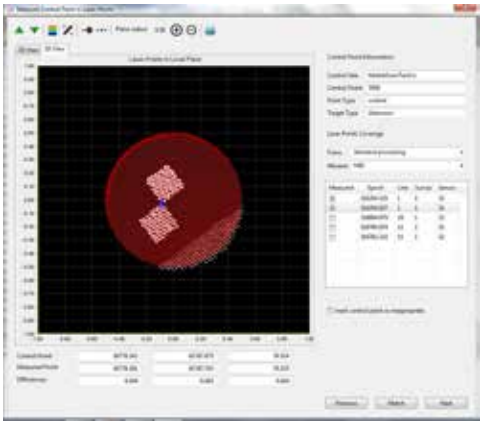


Trajectory corrections based on polynomial model ensure smooth transition among line segments

### Flexible Incorporation of Control Points

LMS lets you easily incorporate control information for trajectory optimization and absolute accuracy validation. You have the flexibility to select the type of control information that is most appropriate for the characteristics of the project area (or a combination of both):

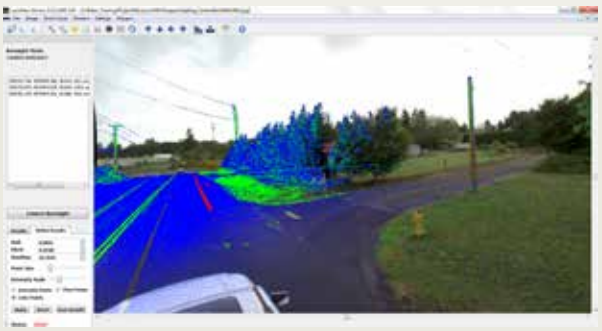
- Traditional control targets: Best alternative for areas without significant planar geometry. Automated target measurement possible for checker-board type.
- Control points on planar surfaces: Ideal for project areas with an abundance of planar surfaces. Facilitates complete automation.



Automated target measurement of checker-board targets

### Accurate Multi-Sensor Data Integration

To ensure accurate co-registration between lidar and imagery datasets, LMS computes the camera exterior orientation (EO) parameters using the optimized trajectory data from the self-calibration engine and the boresight angles computed using an external LMS module (LynxView).



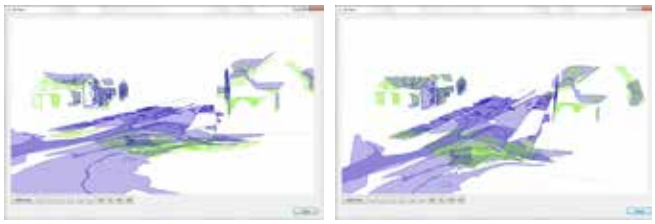
Camera boresighting in LynxView

## LMS for Quality Control

LMS makes project validation easy with integrated quality control tools to verify the absolute and relative accuracy of the data. You can verify these accuracies with a number of reporting capabilities, including reports, plots, graphs and visual analysis tools.

### Lidar Data Relative Accuracy Assessment

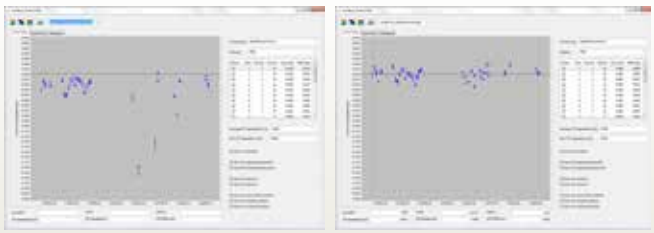
- Detailed reports/plots enable thorough quantitative analysis
- Qualitative analysis tools let you visually inspect compatibility of overlapping lidar data



Visual inspection of compatibility between overlapping lidar data before (left) and after (right) self-calibration

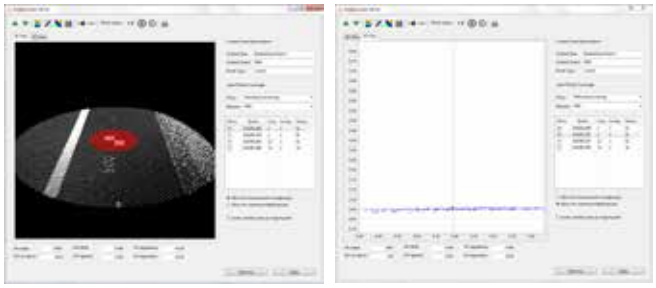
### Lidar Data Absolute Accuracy Assessment

- Charts/reports enable overall project assessment and comparison to ground control before and after self-calibration, either over time, over point, or as a histogram



Control site analysis over time before (left) and after (right) self-calibration

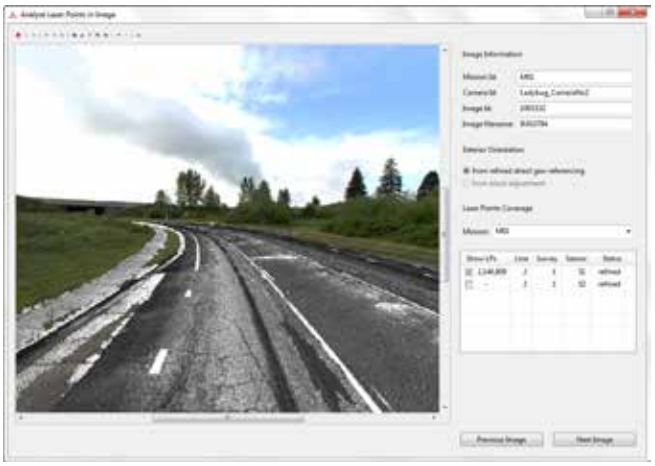
- 3D and 1D views assess the separation between individual control points and the lidar data before and after self-calibration



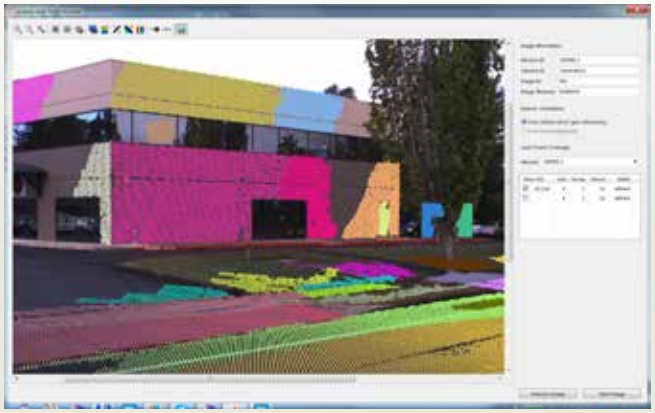
Assessment of individual control points through 1D (left) and 3D (right) views

### Quality Control of Multi-Sensor Data Integration

Visual inspection tools enable you to check the alignment between lidar and imagery datasets.



Extracted lidar planar patches projected to the imagery (colored by intensity) for visual inspection of the co-registration between the two datasets.



Extracted lidar planar patches projected to the imagery for visual inspection of the co-registration between the two datasets.

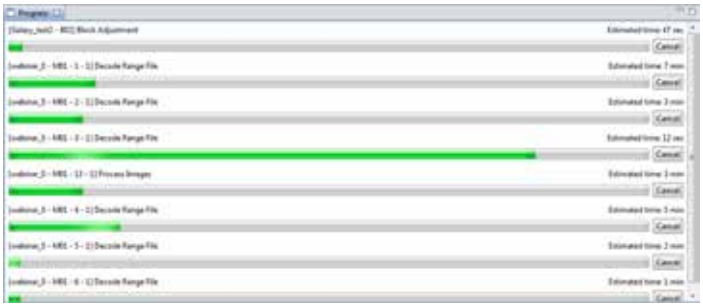
## LMS for Productivity

Processing productivity and efficiency are critical to reducing project costs and completing project deliverables on time. LMS incorporates many standard processes for maximizing processing productivity.

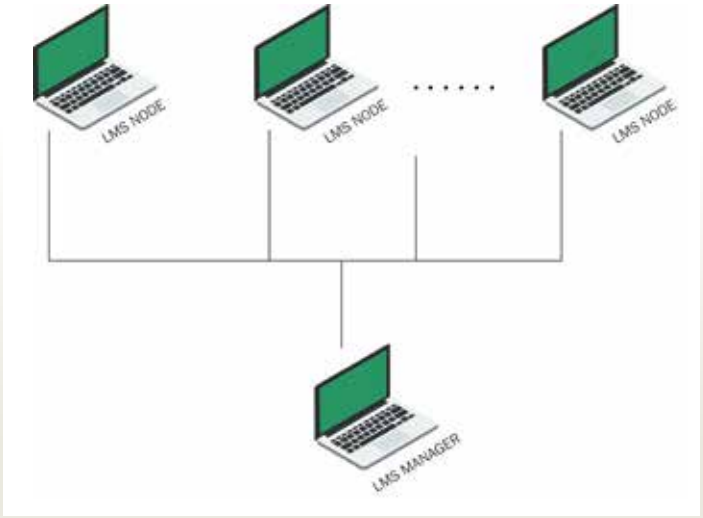
### Batch/Multithread Processing

Key production utilities help process large projects cost-effectively by minimizing the user interaction required:

- Batch processing for large, multi-site projects
- Parallel and distributed processing for minimizing processing time
- Cloud processing compatibility



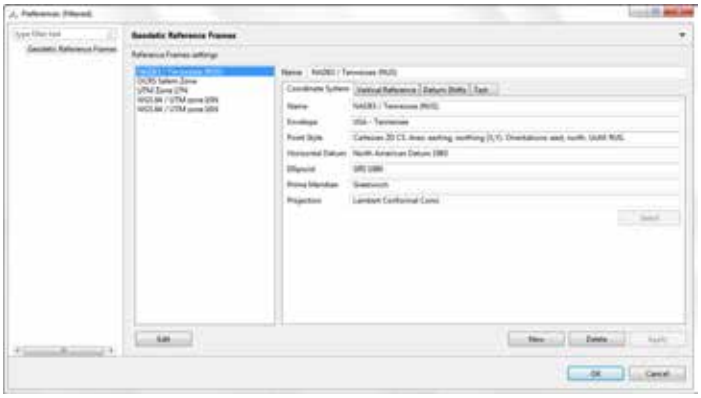
Batch processing



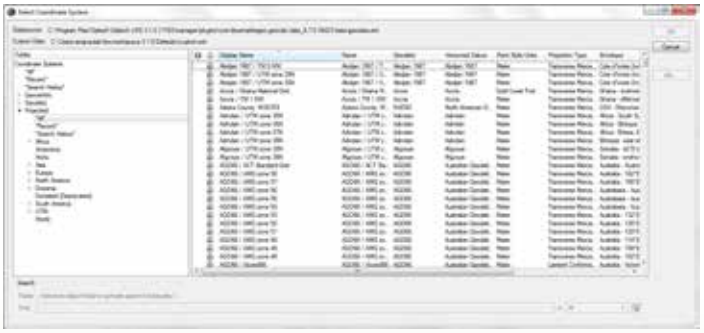

Distributed processing

### On-the-Fly Coordinate Transformation

The Blue Marble GeoCalc SDK is fully integrated in LMS, letting the user output their lidar data and imagery in the desired output reference frame. The user has access to an extensive database of geodetic conversions and geoid models that are updated regularly.



Easy selection of the appropriate reference frame (i.e., coordinate system, vertical reference and datum shift)



Extensive database of geodetic conversions and geoid models

### Integration with 3rd-Party Workflows

The primary objective of LMS is to produce the most accurate lidar point clouds and imagery data possible with quantifiable accuracy measurements, enabling direct ingestion into value-added 3rd-party software. For users interested in making the transition to user-defined post-processing workflows even more seamless, LMS includes the ability to launch 3rd-party executables via a user-specified command file (CMD or BAT). Similarly, LMS outputs to several standard industry formats, including LAS (1.1-1.4) and LAZ.