Use of Mobile LiDAR for Asset Management:

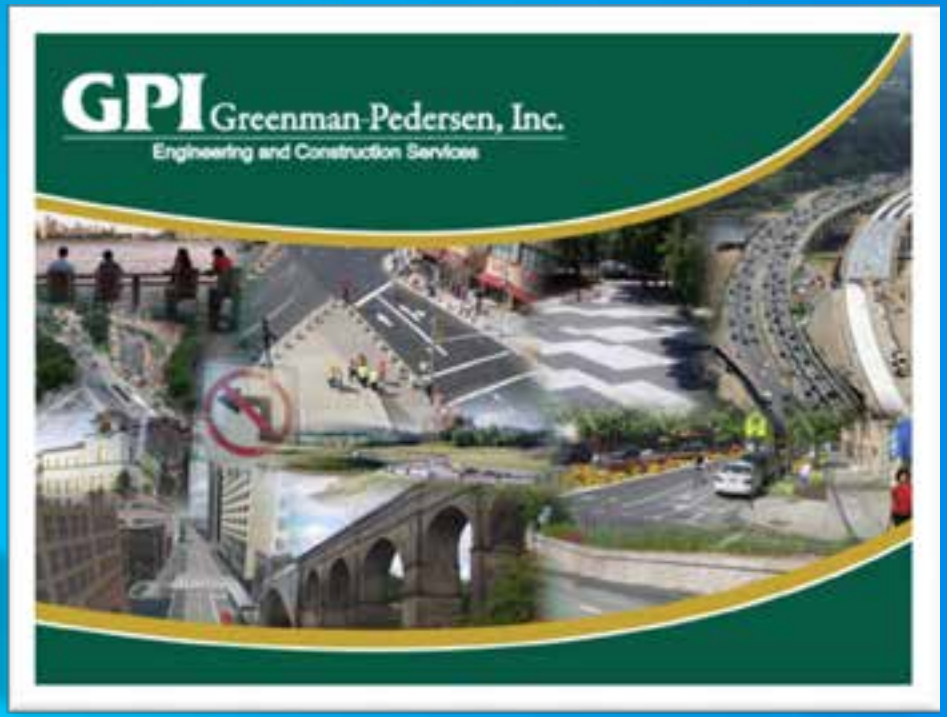
How MassDOT Took an Innovative Approach to Sign Assessment Inventory of Sign Assets

Mark Day

Director of Application Development

About Greenman-Pedersen, Inc (GPI)

- Multi-discipline engineering firm
- Established in 1966
- 1100 employees
- 20 offices
- Transportation Asset Management



Project Overview

- **Traffic Sign Asset Management Project**
  - **Massachusetts DOT**
  - **Inventory of all signage on state-owned routes (6,000 Centerline Miles)**
  - **Night-time Retro-reflectivity condition**
  - **Implement Asset Management System**
  - **Tie into existing Maximo system**
  - **2 Year Project**

GPI Proposal

- GPI has completed over 50 similar projects
- Use high-res LiDAR / high-res images to conduct inventory
- Value Added Proposition.

  Drive it once

  1. Additional Assets
  2. Visualization
  3. Survey Grade Areas

LiDAR 101: What is LiDAR?

- **Light Detection and Ranging**
- **Position of the LiDAR provided by GPS**
- **Position and Orientation of the laser provided by IMU**
- **The scan angles and ranges of the laser are provided by the sensor**
  - **Data post processed to accurately determine the position of each point**
  - **Acquisition:**
    - ***Aerial 400K pps***
    - ***Mobile 1.2 Million pps***
  - **Density:**
    - ***Aerial: 2-100 ppsm***
    - ***Mobile: 2000-5000 ppsm***
- **Point Cloud Data File**

Types of LiDAR

Terrestrial

Airborne

Mobile

- Survey Grade
- Mapping Grade

Data Collection

RIEGL VMX450

- 1,100,000 measurements per second
- Dual 360 FOV Scanners
- 5000 points per sq. meter

NIKON D810

- 36 MP Highest Resolution ML Calibrated Video/Still
- Mapping Camera

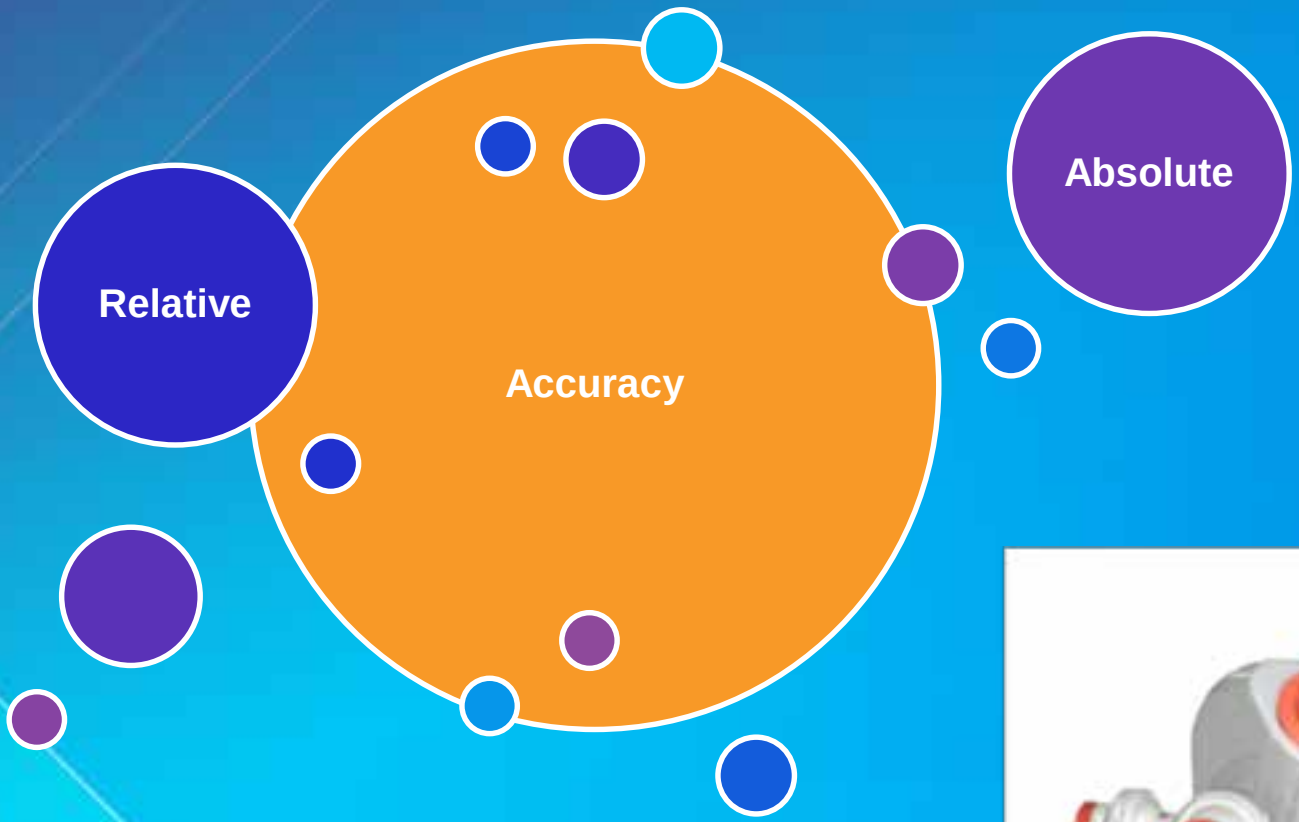
RIEGL VMX450

NIKON D800

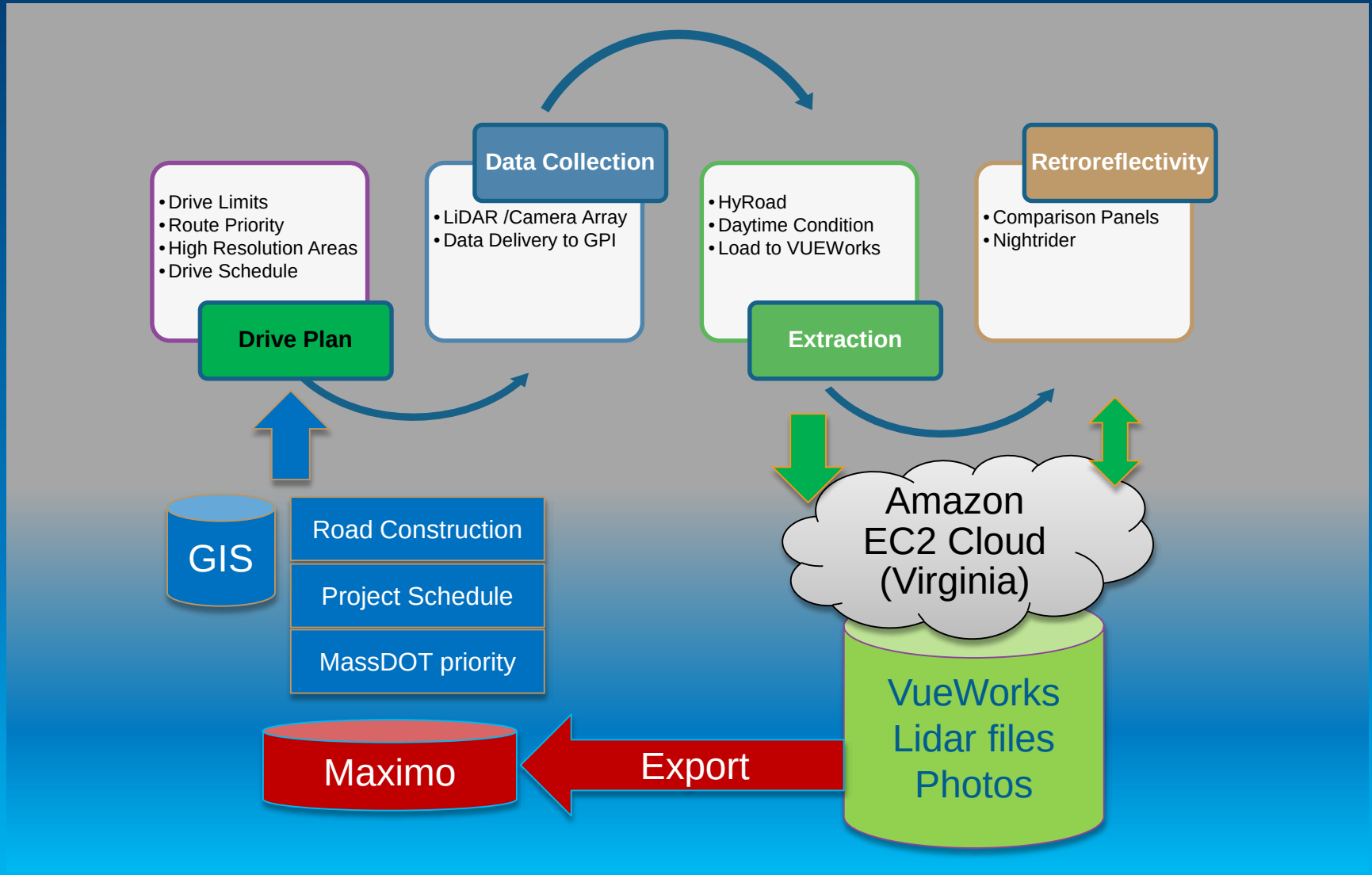
Mobile LiDAR for Roadways

- Survey Grade Scanners
- Riegl VMX 450
- High Scan Rate = Very large data files
- Result: Complex / adoption is limited

“Survey Grade Scanners”



Project Overview



Data Details

- Inventory approximately 250,000 signs
- Dataset is over 50 TB
- 40 TB LiDAR
- How to deal with it?

The Old Way

- Data Extractors navigate through imagery to find assets.
- Work in small sections
- Cut cross sections
- Perform measurements / assessment
- Time consuming / Unorganized

Wouldn’t it be nice to….

Navigate seamlessly through the point cloud

Wouldn’t it be nice to….

View imagery and LiDAR in concert

Wouldn’t it be nice to….

Speed up extraction

Wouldn’t it be nice to….

ILMF

Solution

- Worked with gaming company to develop a Programming Interface
- Developed Custom Extraction software: HyRoad

HyRoad Software Demonstration

Current Project Status

- Extracted over 100,000 signs
- Night Assessed Over 55,000 signs
- Driven over 40% of project
- Driving District 3 & 6

Realized Benefits

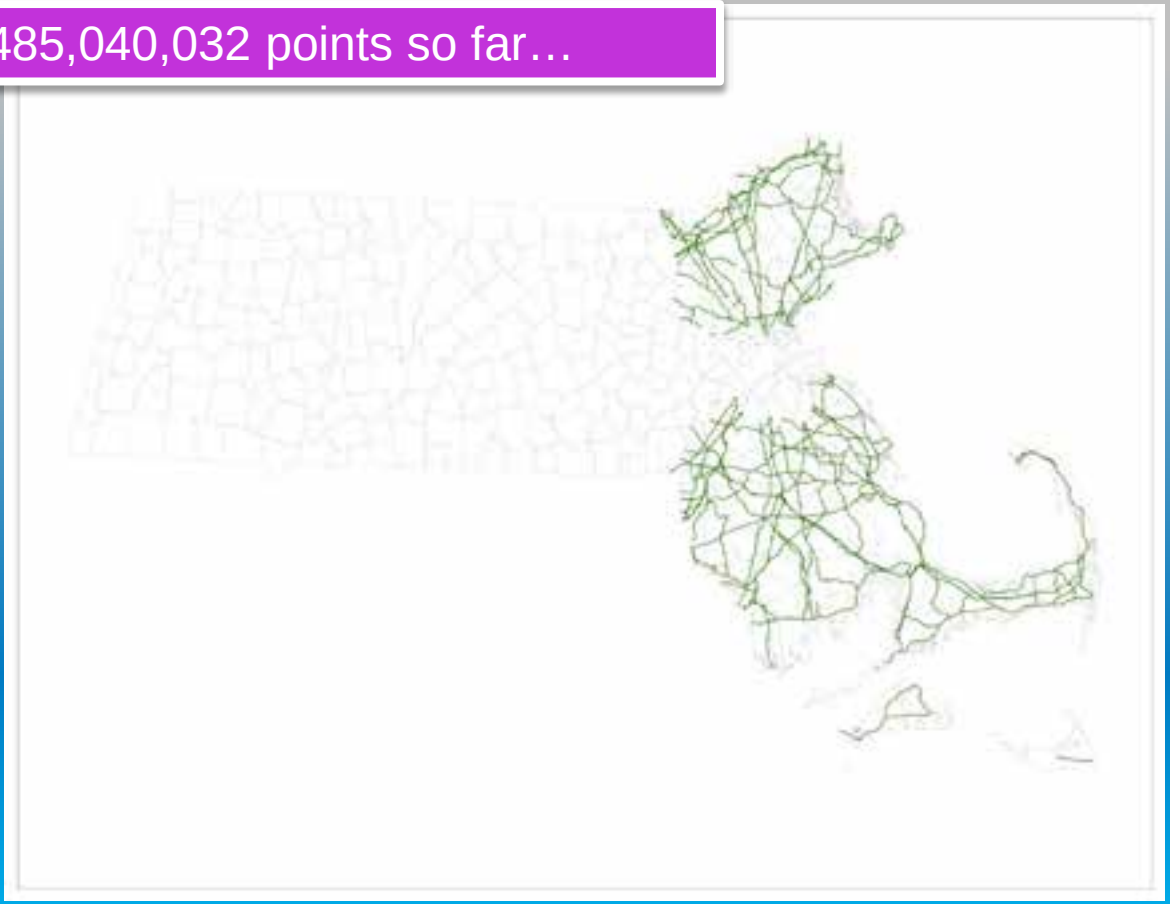
- Ease of locating signs in point cloud
- Increased extraction accuracy
- Can view entire dataset in a single project
- 20:1 Compression at 3cm
- Opened several possibilities for data visualization

Lessons Learned

- Compression allows for new horizons
- 50 TB is easy to say
- Processing….Procedures need to be altered
- Work with good partners

Demo

688,978,485,040,032 points so far…



Questions

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