PARSONS

IMAGINE NEXT

From Inspection to Intelligence: Using Sensors and AI to Modernize Asset Maintenance

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VEHICLE BASED ROADWAY DATA FOR ASSET MANAGEMENT

AI-DRIVEN DETECTION OF ROADWAY CONDITIONS USING ON-VEHICLE SENSORS

Client: Ohio Department of Transportation | Delivery Team: Honda, Parsons, & University of Cincinnati

1. **Potholes**
2. **Ride Quality / Roughness**
3. **Berm Conditions**
4. **Guardrails**
5. **Road Striping**
6. **Road Signs (Damaged & Missing)**

Challenge

- 49,000 lane miles of roadway to maintain assets for.
- Ohio DOT manually checks data through driving each section of the roadway at a minimum of every 2 weeks; pavement done every year.
- Manually record & generate work order maintenance tickets

Approach

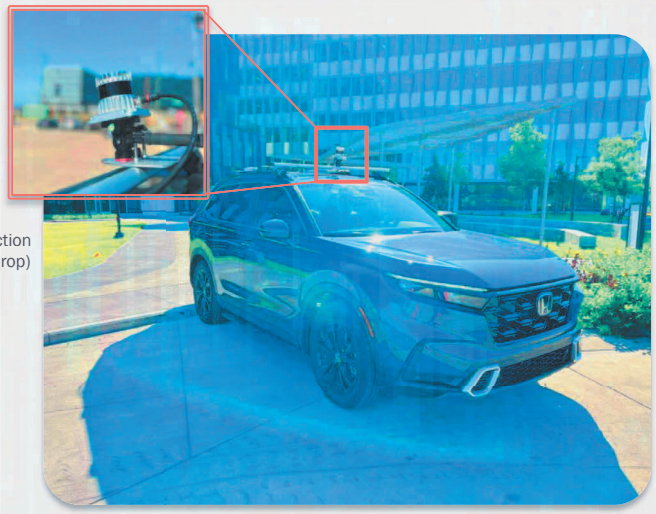
- Use vehicle sensors data to assess assets, ingest data, analyze insights, apply intelligence, teach the machine, group assets by proximity, recommend severity, auto-create work order maintenance ticket with images
- Collaborative effort: Honda (OEM) + Parsons (Systems Integrator + Data Operations) + University of Cincinnati (vision detection feature development) + Ohio DOT (User)
- Two pilot vehicles
- Agile like methodology – thin slice solutioning (**2 districts, 6 types of assets**) with frequent, regular feedback loop & iterating on architecture & design

Expected Outcomes

- Automated reporting of roadside asset conditions
- Efficient, streamlined workflow for work order maintenance
- Confirm value of vehicle-generated data
- Understand the level of collaboration required by key stakeholders & partners for scale up success, especially the road operators' needs
- Shapes future technical direction on vehicle sensor types and placement on vehicles
- System Integrators learn how to best support DOTs for operationalizing data
- Lessons learned to help shape next level roll out

PILOT VEHICLE SYSTEM

UNIVERSITY OF CINCINNATI & HONDA



Berm detection (shoulder drop) – Lidar

ADAS-grade vision sensor:
- potholes,
- Guardrails
- signage

Sensor Fusion Insight
Lidar + Vision increases detection reliability; factors: retro reflectivity, dimensional accuracy.

Detection Capabilities

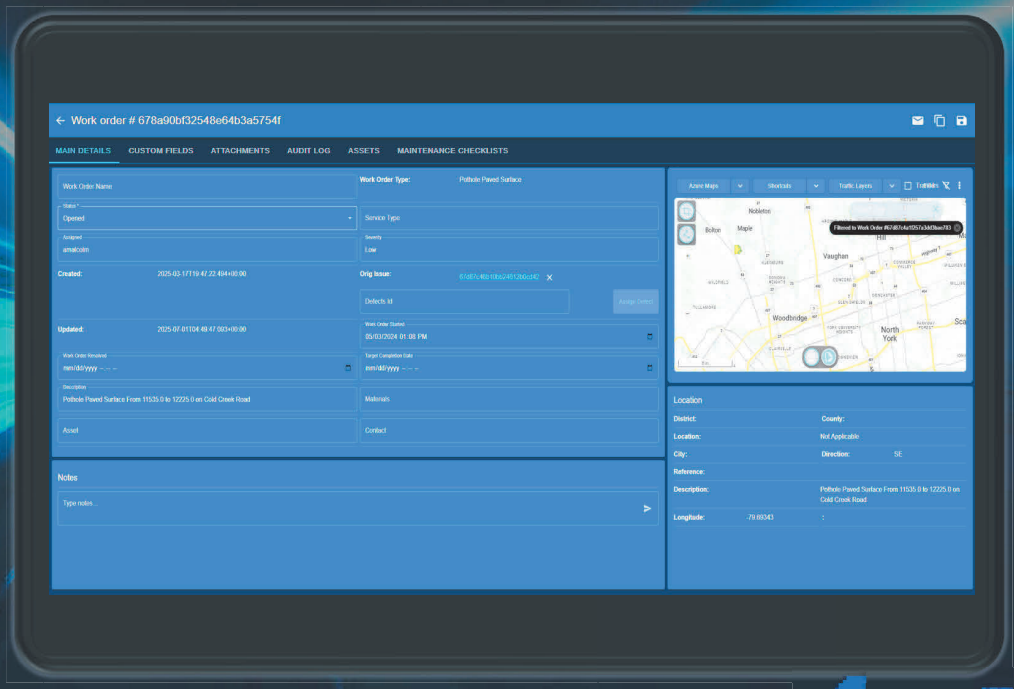
- Lidar for berm (shoulder drop) detection.
- Vision sensor for potholes, guardrails & signage deficiencies.
- Improved reliability using Lidar + Vision Sensor fusion.
- Consider: retro reflectivity, accuracy in dimensions.

Asset Guardian - Work Order Management

Accelerate time-to-detect and time-to-repair while improving scheduling precision and system integration — reducing downtime, lowering costs, and protecting availability-based revenue

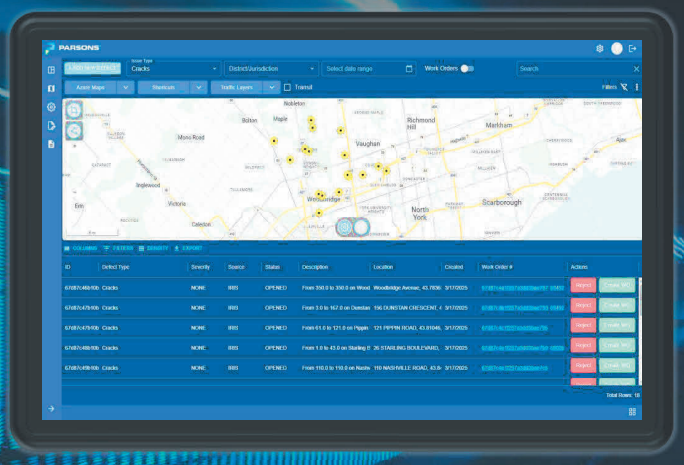
Comprehensive Work Order Management

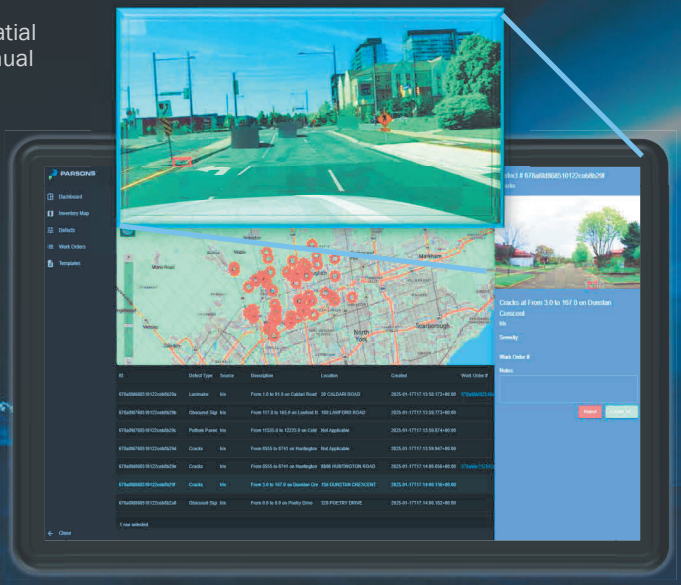
- Track planned and unplanned maintenance
- Automated issue detection and ticketing
- Manual work order creation and crew assignment
- Routine Maintenance Scheduling
- Configurable User Interface for Rapid Deployment
- Integration with External Work Order Management Systems



Asset Guardian - Defect & Issues

Drive quicker triage and dispatch decisions by consolidating defect data, geospatial context, and supporting imagery in one view — reducing response time and manual coordination.





Defect & Issue Tracking

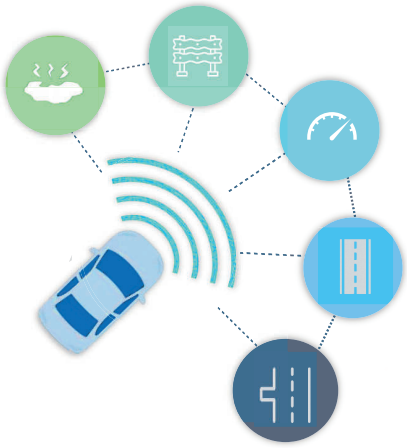
Searchable tabular and GIS map views for any trouble tickets, maintenance issues and defects that have been collected by Asset Guardian.

Defect Visualization

Track defects from operator entry, generated by the ATMS, fleet vehicles and camera AI. View camera footage and defect detection area for easy triage of problems.

DATA ANALYSIS & ACCUARY

DELIVERING RELIABLE, ACTIONABLE ROADWAY INTELLIGENCE



Detection Scope

- **Thousands of** roadway deficiencies detected across Districts **6 & 10** using connected **Honda** vehicles integrated with **Asset Guardian.**
- Data captured across nearly 2,000 roadway miles over a 4-month pilot period.
- Leveraged vehicle data, including aftermarket sensors, and advanced analytics for defect identification and classification.

- **Potholes:** up to 84% accuracy.
- **Guardrails:** 93% accuracy across 5 counties.
- **Traffic Signs:** >99% accuracy, <1% misclassification.
- **Lane Markings:** 98% accurate
- **Shoulder Drops:** 76.3 mi detected (~3.9% of surveyed roads).

Key Detection Insights

1. **Lighting & Shadow Conditions**
   Detection varies slightly by illumination and time of day. Reflectivity is key.
2. **Improved Safety of Field Team**
   fewer manual inspections and reduced exposure on roadways.
3. **Accurate Sign Detection for Asset Inventory**
   precision reliable enough for DOT baseline inventories.
4. **Reduced Inspection Distraction**
   Automated detection eliminates human tendency to jump between defects identified ("squirreling"), improving focus and consistency.

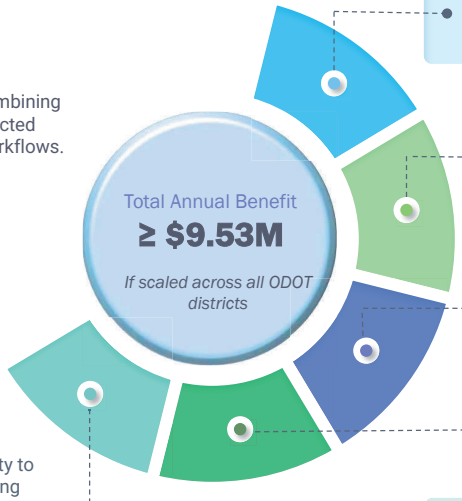
Key Takeaway

- **We did establish that upon scale, vehicle data + integration + work order maintenance operation** will be a viable combination for enhancing the way critical roadside infrastructure assets are assessed and maintained today; enabling faster, safer, and more consistent maintenance decisions for DOTs.

COST–BENEFIT SUMMARY

TRANSFORMING ASSET MANAGEMENT EFFICIENCY AND ROI

The pilot demonstrates measurable cost and operational benefits across ODOT districts—combining automation, predictive maintenance, and connected vehicle data to optimize asset management workflows.



Labor Efficiency Gains
$4.53M annual labor savings statewide from reduced inspection and planning hours.

Maintenance Optimization
$5M+ annual restriping savings from routine annual centerline painting default to "as-needed".

Operational Automation
Reduced duplicate system entries

Risk Reduction
Fewer road-user claims via proactive repairs and predictive analytics.

Strategic Outcome
Proven pilot success enabling statewide adoption and modernization of asset workflows.

Key Takeaway

Connected vehicle data demonstrated the ability to deliver substantial cost and time savings—paving the way for statewide adoption and long-term modernization of ODOT's asset management practices.

Solution Architecture

Sensor Input Agnostic

SENSOR SOURCES

Mounted Sensors

- Vehicles

Integrated Camera Sensors

- Stationary & Mobile Camara / Drones

PARSONS

EDGE PROCESSING & ALGORITHMS

Asset Detection & condition Algorithms

MODEL TRAINING

Data processed on Edge with Compute AI Model

Model is Retrained

Training Data

Automated Data Ingest

Results Uploaded

Data Hub

- Data Normalization
- Image Storage

Agency User Access

Data Operationalization

Asset Guardian

User Reviews Defects

Operational Dashboards

Work Order Management

User Review of Defects Results

Automated Cluster Recommendations

Work Orders Over Time

Defects Over Time

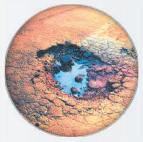
Feedback to refine Model

SENSOR DATA FOR SHARED USE PATH (SUP) ASSET MAINTENANCE

AI-DRIVEN DETECTION OF PATH ASSET CONDITIONS USING ON-VEHICLE SENSORS & OPERATIONALIZATION OF DATA USING ASSET GUARDIAN

Client: City of Dublin

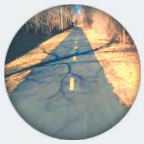
Phase I: Feb – June 2026



Potholes

Surface Distress / Cracking

Sharp Turns



Pavement Markings

Road Signs (damaged or obstructed)

Phase II: July '26 – Dec '27

Guardrails

Bridges/ Tunnels

General Pavement Condition

Trench Drain

Mirrors

Cabinets

Lighting

Trash Bins

Vegetation Overgrowth

Challenge

- **158 miles** shared use path assets to maintain
- Maintenance team drives path today and does visual inspection, records insights into city systems
- Several systems are used to facilitate asset maintenance today

Approach

- **Operational-first pilot |** Equip maintenance fleet golf carts with vision sensor cameras.
- **Focused analytics |** Analyze high-value assets using targeted algorithms for actionable maintenance insights.
- **Iterative learning |** Refine data and outputs through short feedback cycles with the City.
- **Early operationalization |** Deploy Asset Guardian as the system of record in Phase I.
- **Scalable by design |** Define standards and integrations early to enable future expansion.

Expected Outcomes

- Demonstrate feasibility of collecting reliable shared-use path condition and asset data using a City-operated, sensor-equipped golf cart.
- Establish a baseline asset inventory and condition profile to enable proactive maintenance.
- Convert sensor data into actionable maintenance insights through Asset Guardian.
- Define a scalable and repeatable model to support future phases and reduce Phase II effort and cost.

AUDIENCE DISCUSSION

Let's learn from each other.

1. How many agencies here still rely primarily on manual roadway inspections today?
2. What asset type would provide the biggest value if condition data could be collected continuously instead of periodically?
3. What do you think is the biggest challenge to operationalizing AI-generated asset data?