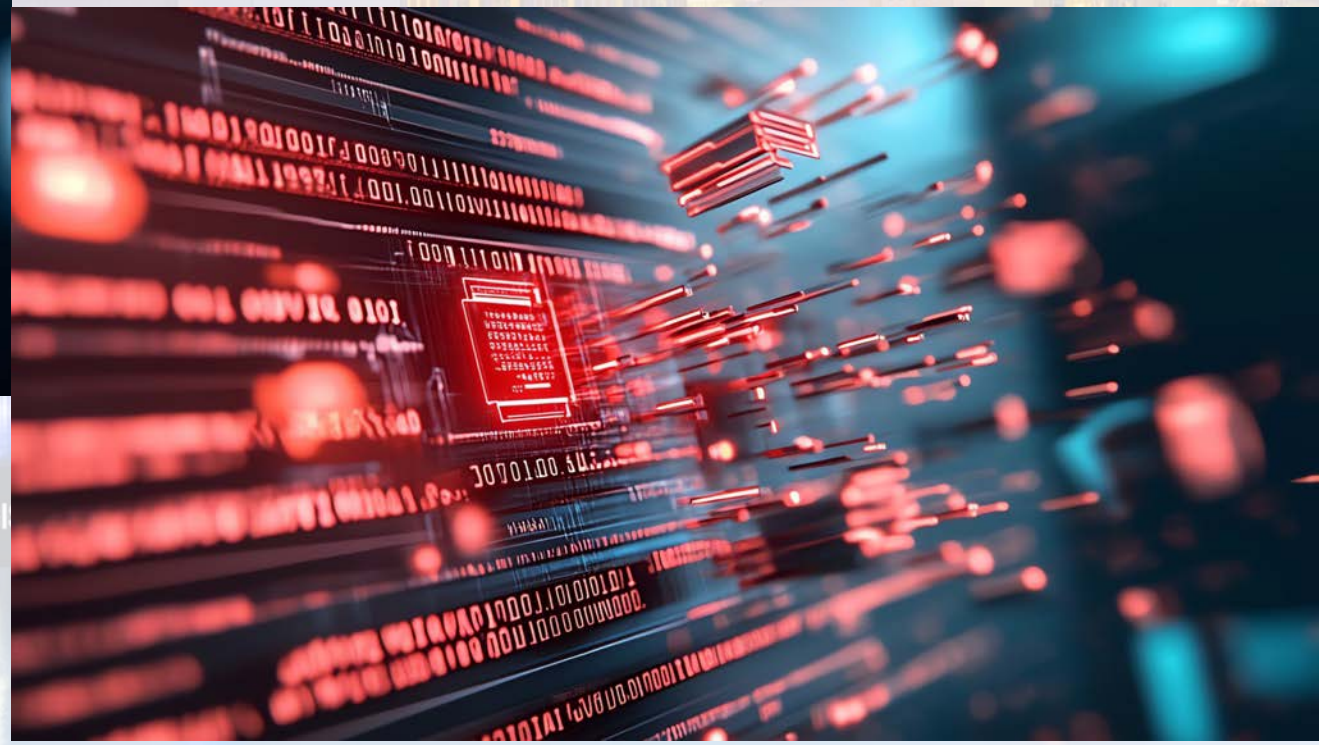
2024 FAV Summit: Modernizing Data Solutions



2024 FAV Summit: Modernizing Data Solutions

Moderator: Glendora Fortune, PMP, CPM, CSM, FCCM – Chief Information Officer

Office of Information Technology, Florida Department of Transportation

Friday, September 6

11:00am - 12:30pm

Modernizing Data Solutions

Friday – September 6th – 11:00am – 12:30pm

Moderator: Glendora Fortune, PMP, CPM, CSM, FCCM

Chief Information Officer
Office of Information Technology
Florida Department of Transportation

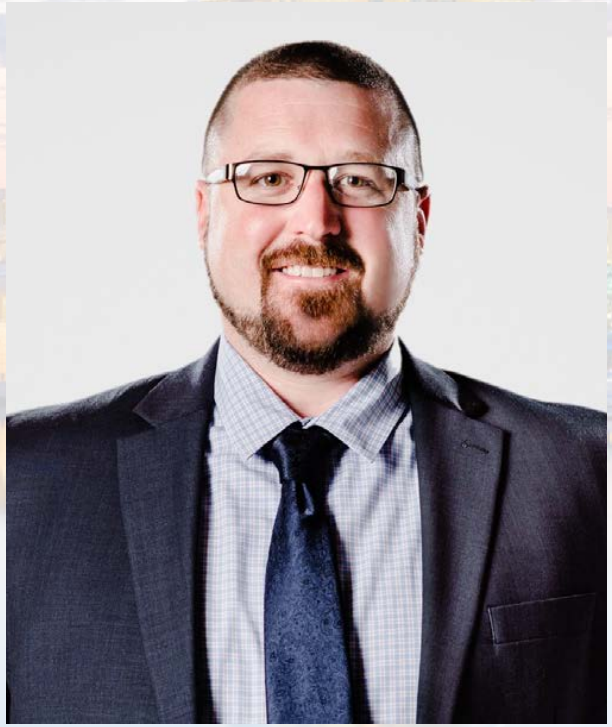
FDOT

Our Presenters

Christine McDonald, B.S.J.
Data Governance Administrator
Florida Department of Transportation

Stephanie Tanner, MBA, PMP
Information Security Manager
Florida Department of Transportation

Sue Zheng, PhD, PE
Director, Office of Materials
Florida Department of Transportation



Chase Fleeman
Director of Operations,
International Cybernetics Company (ICC)

FDOT Technologies: The Role of Data Governance in a Modern Technology Framework

Christine McDonald, B.S.J.
Data Governance Administrator
Florida Department of Transportation

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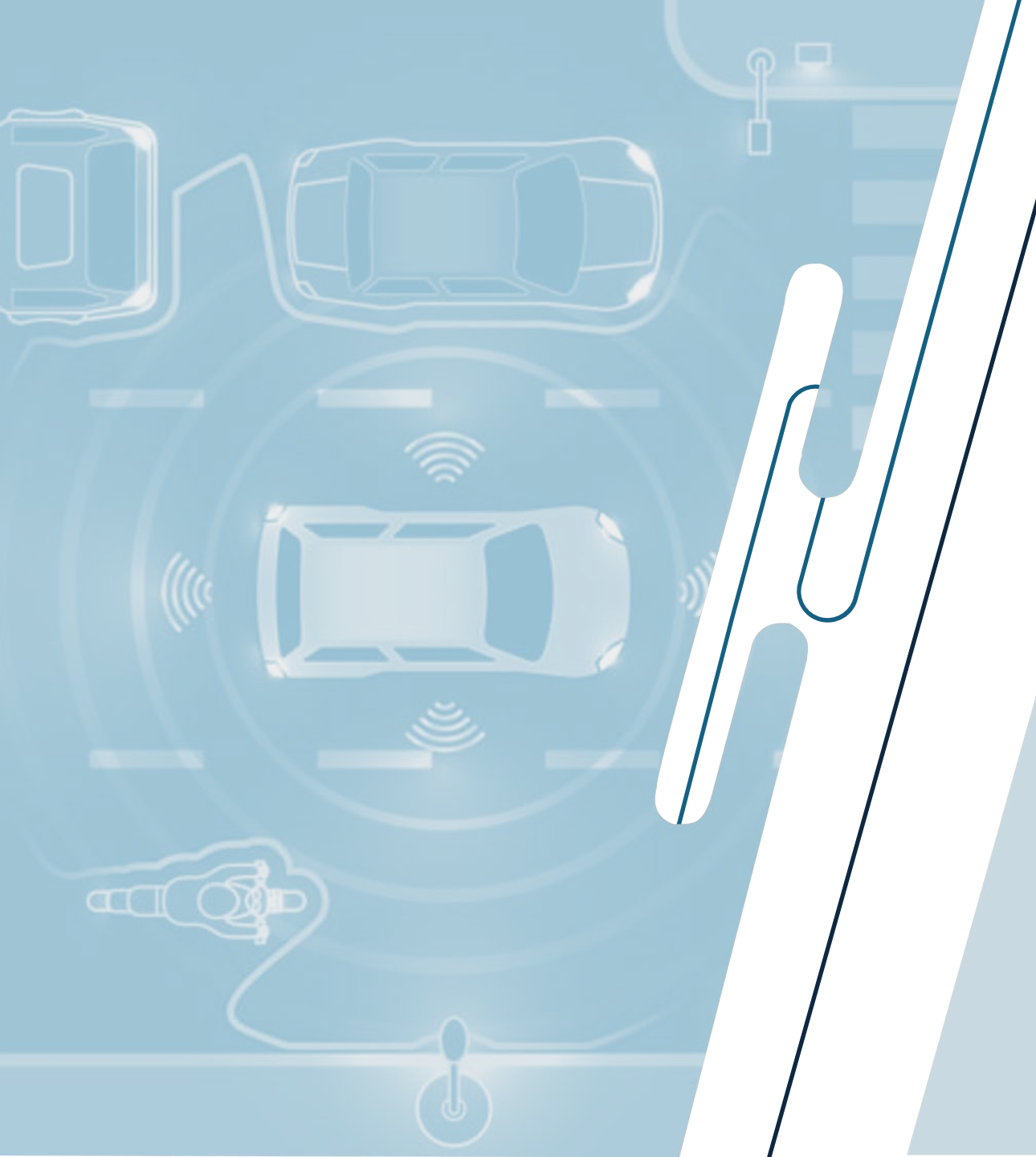
Civil Integrated Management
Florida Department of Transportation



FDOT Technologies:

The Role of Data Governance in a Modern Technology Framework

Presentation By:

Christine McDonald, B.S.J.

Data Governance Administrator

FDOT Civil Integrated Management

FDOT Technologies:
What is Data Governance?

Data Governance: The practice of organizing, classifying, securing, and implementing policies, procedures, and standards **for the effective use of an organization's data**.

(Florida Statute 282)

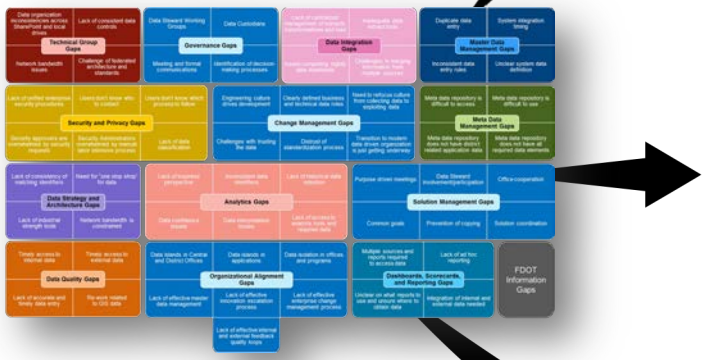
FDOT Technologies:
Why is Data Governance Important?

- **Reliability** – Helps to ensure that information is secure, accurate, reliable and at the appropriate level to empower users to do a better job.
- **Accessibility** - Helps to provide the ability to access relevant business data more quickly and efficiently by knowing where to find it.
- **Timeliness** - Helps to reduce the amount of time to locate the data you need and provides more time to analyze the data.
- **Productivity** – Helps to support the effective sharing information across an organization to enable better and faster decisions.
- **Integration** - Helps to enable a greater capability to link data together from different business areas and various systems.
- **Sharing** - Helps to remove barriers currently in place that may prevent the efficient sharing of information.

FDOT Technologies:
Organizational Approach

Reliable, Organized, Accurate Data Sharing (ROADS)

The foundational principles of the ROADS Initiative is helping to close the data and information gaps identified by:



<u>People</u>: Establishing a formal data governance structure to make key decisions related to data/ information.

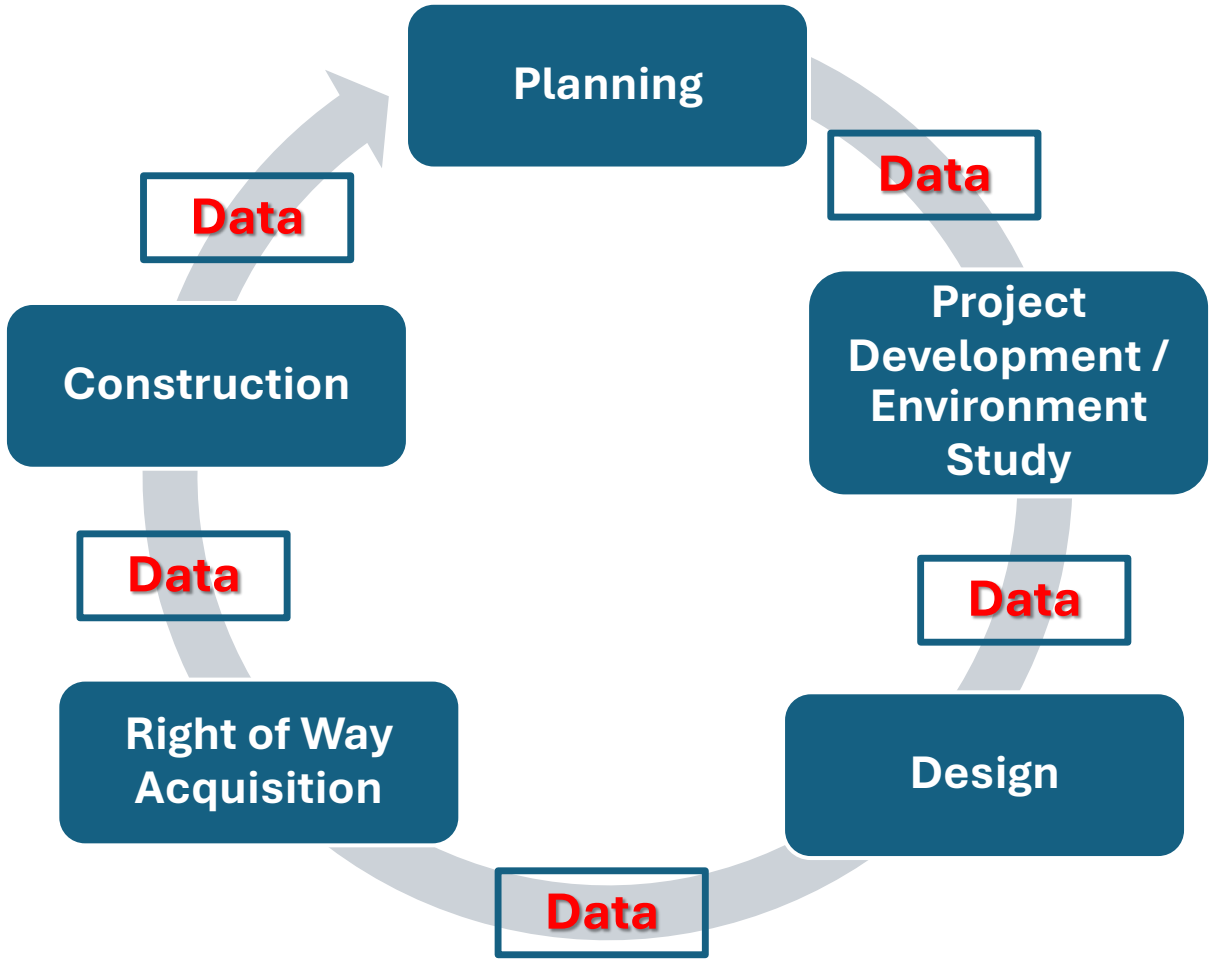
<u>Process</u>: Training staff on the Data Governance Component Model and implementing standard processes and routines to provide a formal approach to data governance.

<u>Technology</u>: Providing common standardized business intelligence tools, technologies and frameworks that can be used across the organization to make data/ information more accessible.

FDOT Technologies:
A Shared Vision

- Better and informed decision making
- Improved organizational goals
- An increased rate of innovation
- Employee growth and development
- Enhanced communications
- Improved business processes
- Sharing of specialized expertise
- Faster problem-solving

FDOT Technologies:
Data Integration Lifecycle



FDOT Technologies:
Digital Journey

3D Modeling/BIMi

- Intelligent Plans
- Model as the Deliverable
- BIM Dimensions

Digital Construction

- Visualization
- Efficient Documentation

Cost Savings

- Less Rework
- Eliminate Redundancy

Increased Digitalization/ Project Delivery

- Interoperability
- Data Federation

FDOT Technologies:
Future Needs

Increased Productivity

- Efficiency

Data-Driven Design

- Visualization

Cost Savings

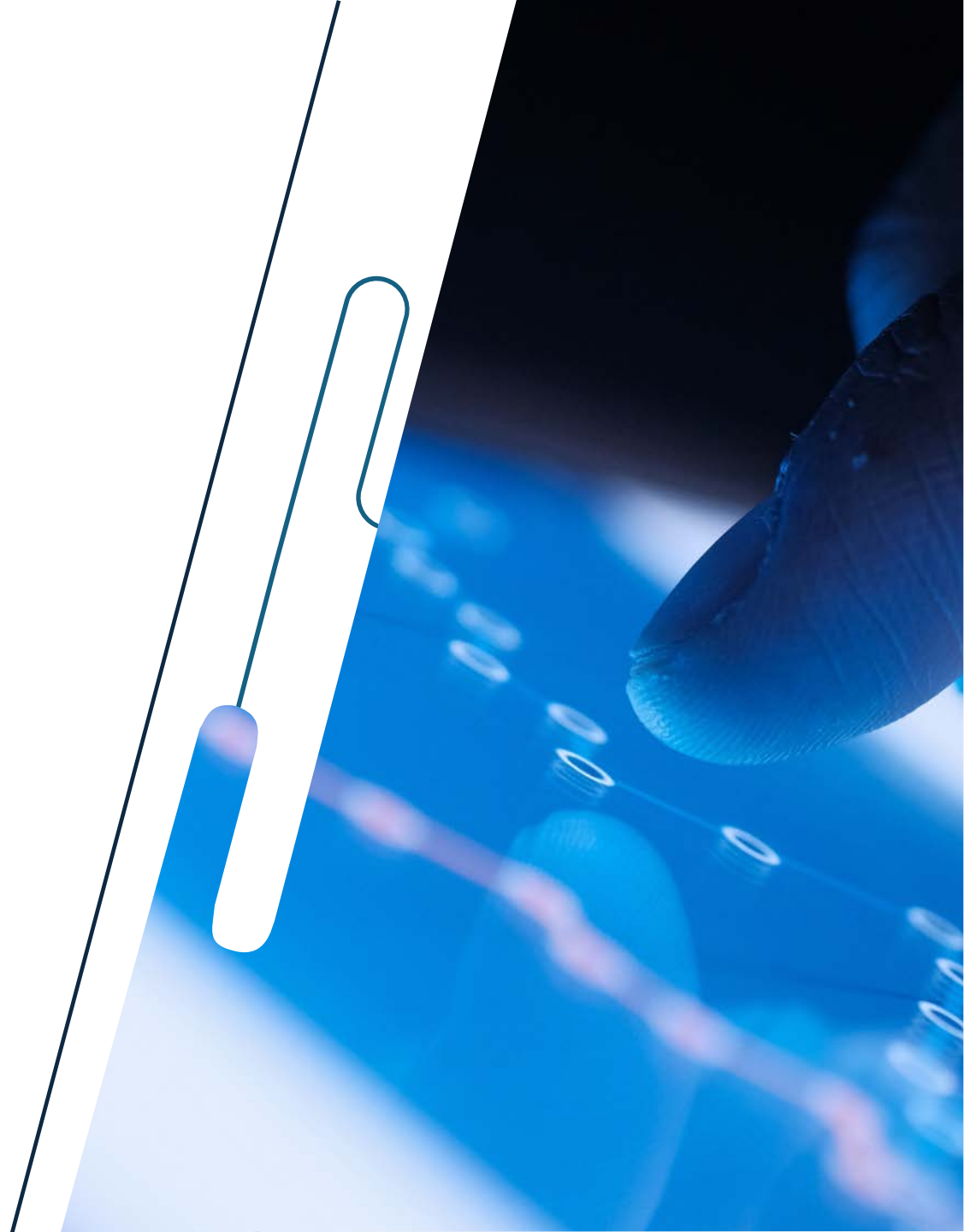
- Less Rework
- Eliminate Redundancy

Increased Digitalization/Organizational

- Interoperability
- Single Source of Truth

FDOT Technologies:
Challenges

- Unified Vision
- Differing Standards
- Policies and Procedures
- Limited Engagement
- Limited Awareness
- New State Laws, Rules and Regulations
- Technology Convergence



FDOT Technologies:
Examples of Technology Convergence

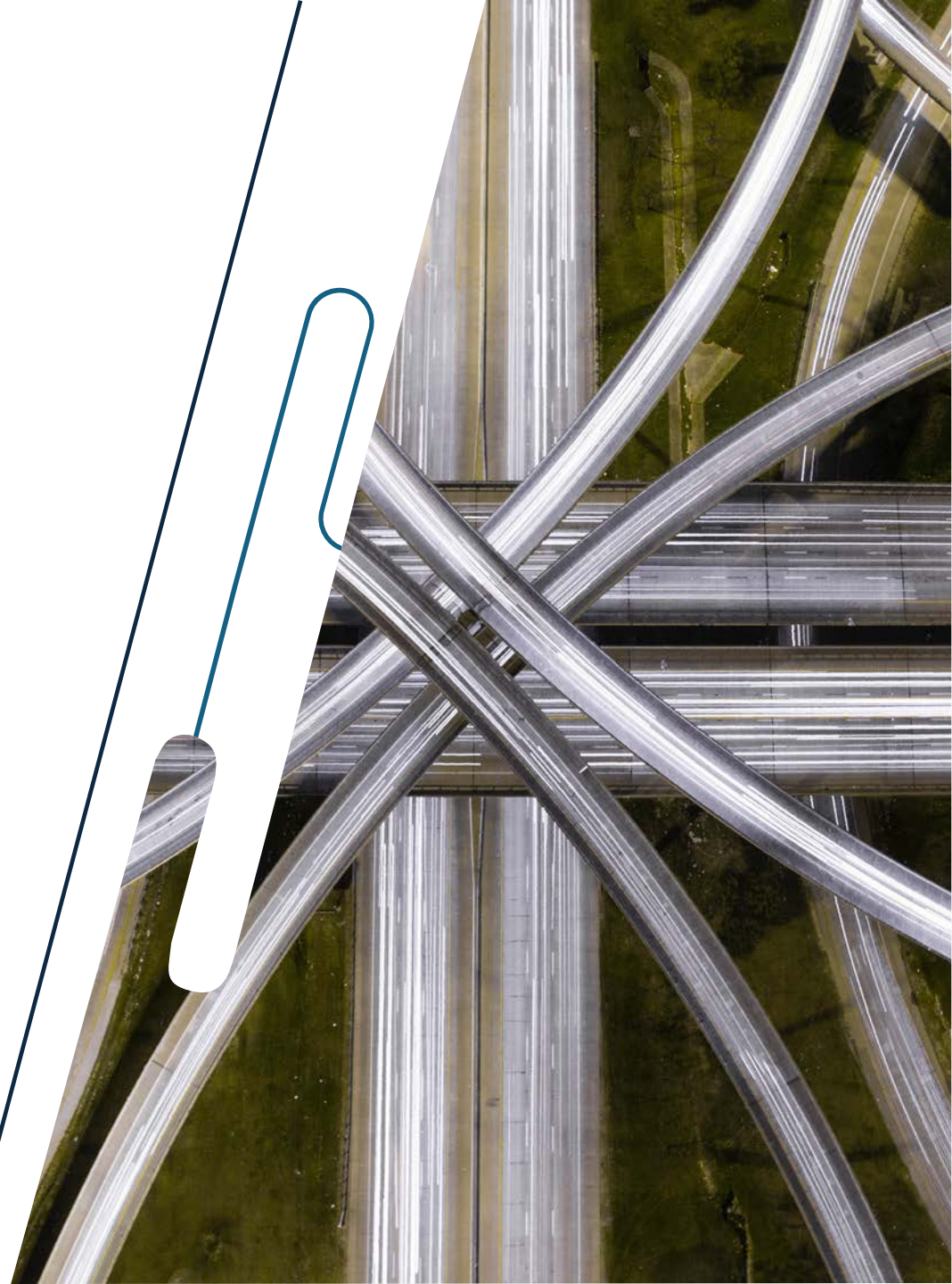
- **Cell Phones**
  - Phone - Camera - Camcorder – Text Messaging - Internet - GPS – Music - More
- **Televisions/Tablets**
  - Digital Programming – Internet – Music – Digital Displays – Computer Monitor - More
- **Cars**
  - Transportation – Internet – GPS – Music – Data Capture/Analysis - More
- **Smart Watches**
  - Health Monitoring - Exercise Tracking - Sleep Tracking – GPS - Text Messaging – Phone – Fall Detection - More

FDOT Technologies:
Drivers

- Natural Progression
- Speed of Innovation
- Customer/Business Needs
- Cost Savings

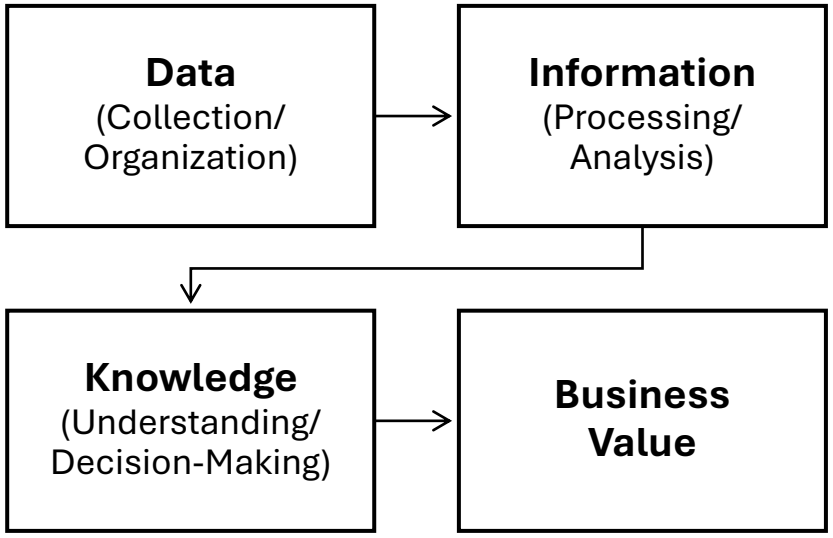
FDOT Technologies:
Opportunities for Integration (IT/OT)

- **Focus** – Data Standardization/Integration
- **Applications** – Modular Configuration
- **Hardware** - Interoperability
- **Software** – Device, Operating System and Platform Compatibility
- **Network Topology** – Streamlined Connections
- **Security** – Unified Environment



FDOT Technologies:
Achieving Business Value

- Ensures data is reliable, organized and accurate.
- Supports an environment of continuous learning for data-driven decision-making.
- Provides “trustworthy” data so knowledge can be gained.
- Supports the automated extraction and delivery of knowledge.



FDOT Technologies:
Future Vision

- Authoritative Data Sources
- Data Inventories (IT/OT/ET)
- Data Management/Technology Strategy
- Data Quality
- Enhanced Platforms
- Expanded Data Governance Structure
- Funding
- Self-Service

FDOT Technologies:
Effective Data Governance

Platforms	Open Platforms
Standards	National and International Data Standards
Self-Service	Further Enable Self-Service
Foundations	Build Upon Existing Data Governance Foundation
Innovation	Support Innovation and Modernization
Frameworks	Established Frameworks: Ongoing Reassessment of Tools, Processes and Procedures
Data Literacy	Increase Staff Awareness
Inventories	Formal Management of Vital Data and Technology Assets
Promotion	Continue Efforts to Promote Data Governance as a Priority
Benefits	Promote the Value of Managed Data

Thank You

Christine McDonald, B.S.J.
Data Governance Administrator
FDOT Civil Integrated Management

Modernizing Data Solutions with Security & Privacy In Mind

Stephanie Tanner, MBA, PMP
Information Security Manager
Florida Department of Transportation

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FDOT

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INFORMATION SECURITY MANAGEMENT

Technology Changes


WHAT IS GIS?
GEOGRAPHIC INFORMATION SYSTEMS
MAPS
APPS
CAREERS
DATA
SOFTWARE
SATELLITES

Use Your Framework


manages a
privacy policy
protect a
collecting

Data Privacy

- Handling of personal data

Data Security

- Protecting information from unauthorized access, use and disclosure

Guidance for Private Industry

Florida Digital Bill of Rights (2024)

o Took effect on July 1, 2024.

o Give consumers a way to protect their personal data.

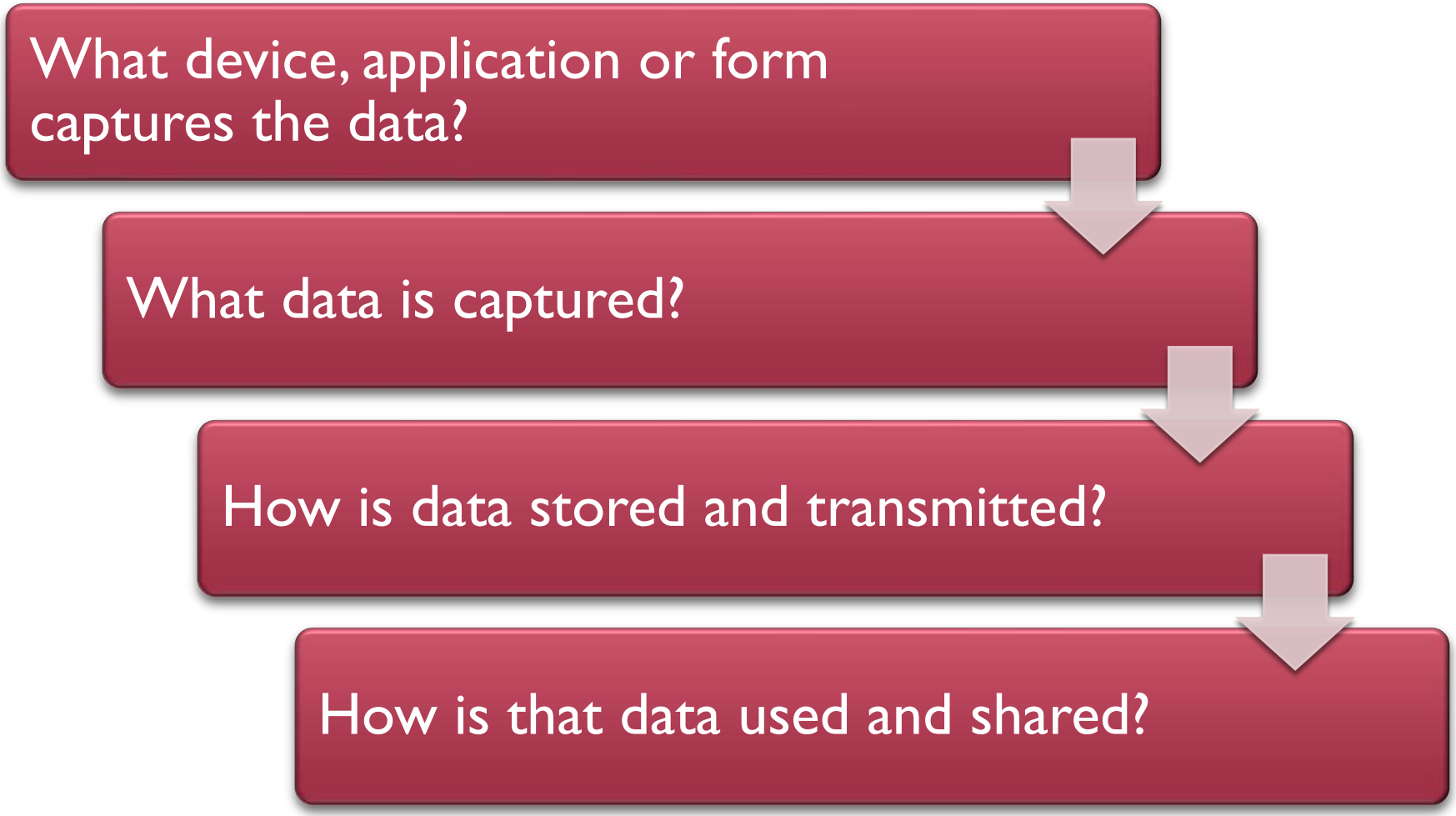
o Big data brokers.

Guidance for Government

Florida Information Protection Act (2014)

o Requires Notifications to consumers in cases of data breach.

Data Pipeline



Data Pipeline

What device, applicati
captures the da

W

Ho
mitted?

Ho at data used and shared?

Identify	• Have an Inventory • Risk Assessment – Where are your biggest threats?
Protect	• Prevent unauthorized access • Protect data and systems based on sensitivity
Detect	• Continuous Monitoring • Must know "normal" to identify "non normal"
Respond	• Incident Response Team and Plan • Communications Plan
Recover	• Backup and Recovery that is tested • Business Continuity Plan

Thank You!

Stephanie Tanner

Stephanie.Tanner@dot.state.fl.us

INFORMATION SECURITY MANAGEMENT

Next-Gen Pavement Management:
Leverage Data and Technology for Strategic Alignment

Sue Zheng, PhD, PE
Director, Office of Materials
Florida Department of Transportation

Next-Gen Pavement Management: Leverage Data and Technology for Strategic Alignment

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FDOT

Florida Department of
TRANSPORTATION

Next-Gen Pavement Management

Leverage Data and Technology for Strategic Alignment

Sue Zheng

September 6, 2024

Introduction

FDOT's Mission

The mission of the Florida Department of Transportation is to provide a safe statewide transportation system that promotes the efficient movement of people and goods, supports the state's economic competitiveness, prioritizes Florida's environment and natural resources, and preserves the quality of life and connectedness of the state's communities.

Mission becomes impossible without highways in a good pavement condition.

A Robust Pavement Management System

The Key to Preserving our Pavement Investments,

The Key to Maintaining the Serviceability at Lowest Life-cycle Cost.

Key Element 1 - Pavement Condition Assessment: Accurate and Continuous

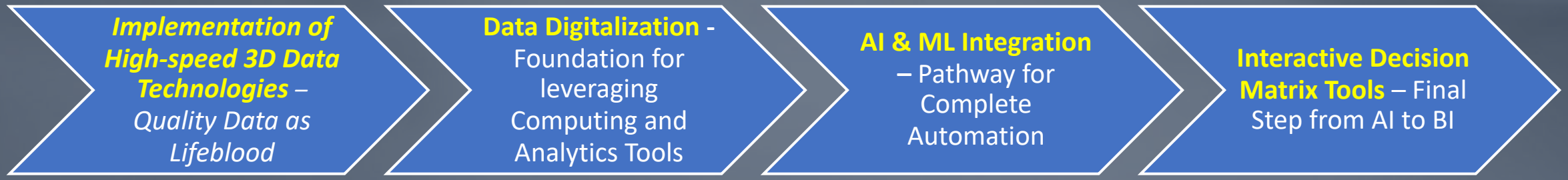
Leveraging advanced data collection and analysis tools and integrating AI and ML for automated assessment and reporting to achieve precision, digitalization, and automation.

Key Element 2 - Pavement Performance Modeling: Intelligent and Efficient

Connecting materials, design, construction, and maintenance decisions to anticipated pavement performance and their financial implications.

Address agency needs at the project, network, and strategic levels

Pavement Condition Assessment - FDOT's Achievements

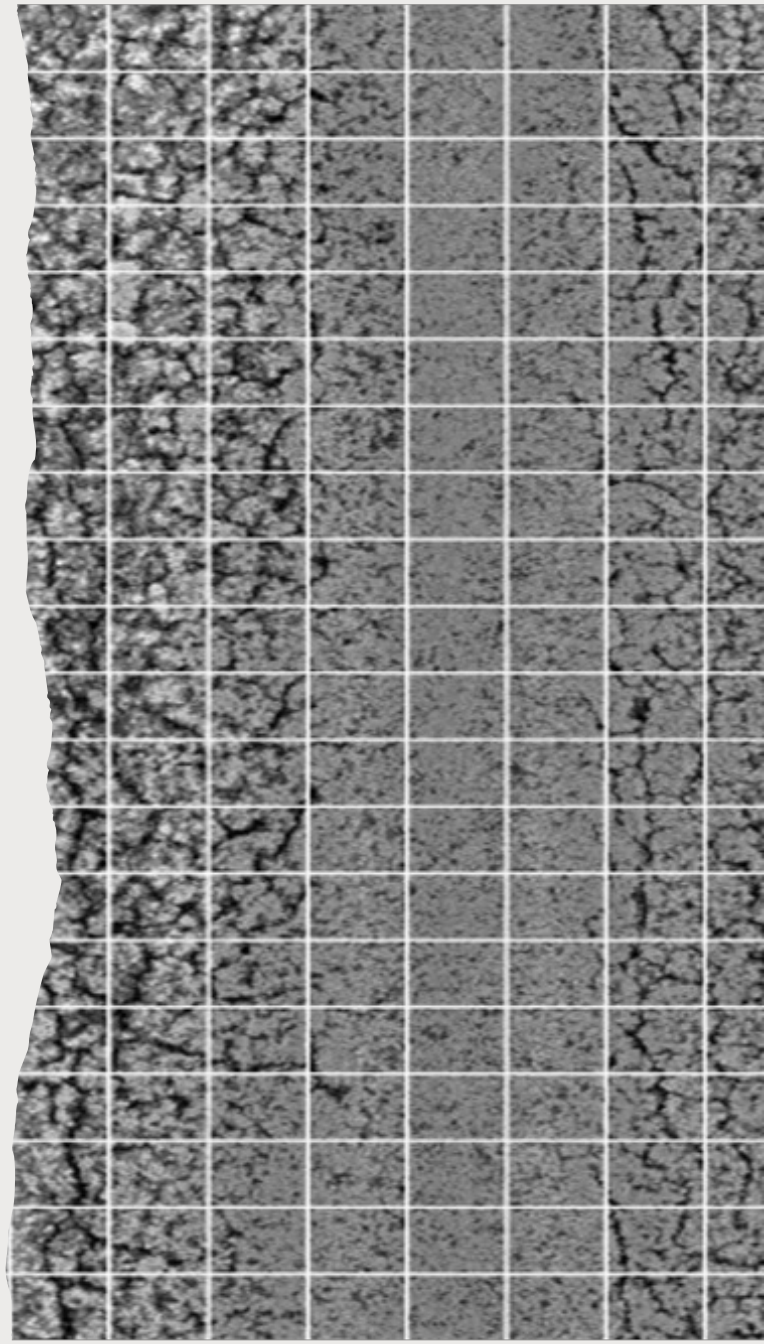


High-speed 3D Pavement Data Technologies

- Eliminate the Subjectivity of manual rating, reducing the inconsistency among human visions, improving the accuracy;
- Improve the precision and accuracy of the rating system by the higher resolution imagery data.
- Improve efficiency by collecting the data at during speed and real time analysis.

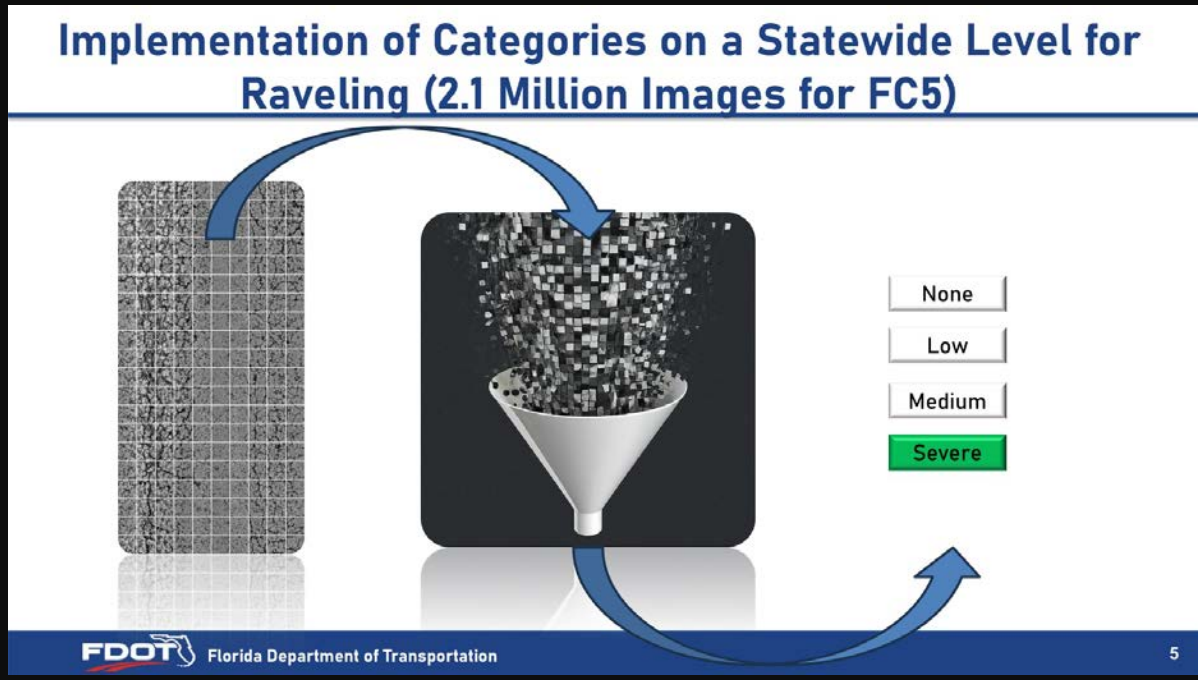
Pavement Data Digitalization

- **Foundation for Leveraging Computing and Analytics Tools**
  From manual rating to high-resolution 3D digital data, we have utilized advanced computing to automate data analysis, reduce field verifications, and increase data accuracy.



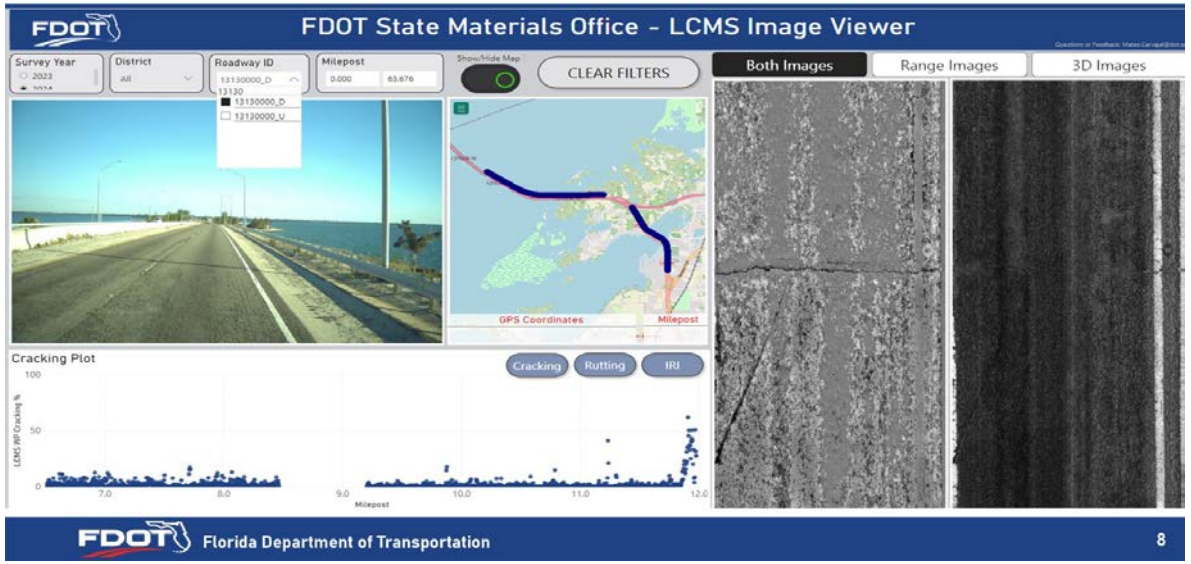
AI & ML Integration

- **Pathway to Complete Automation**
  Integrated AI and ML into pavement distress assessments, particularly for identifying and quantifying raveling and cracking, which are the primary triggers for resurfacing needs.



Raveling Tools Available

LCMS Image Viewer Final - Power BI (powerbigov.us)



Enhanced Tools for Better Decisions

From Artificial Intelligence (AI) to Business Intelligence (BI)

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Address agency needs at the project, network, and strategic levels

The Ongoing Struggle

Identifying the Root Causes of Premature Pavement Distresses: Despite the vast datasets at our disposal, pinpointing the specific causes remains elusive.

Forecasting the Impact of Design Changes: Whether altering materials or modifying installation methods, predicting performance outcomes is still fraught with uncertainty.

We have plenty, but not what we need most:

Hidden Correlation and Patterns

Between current Policy/Practices AND Pavement Performance

Experiencing Thirst In a Vast Ocean of Data

A Robust Pavement Management System

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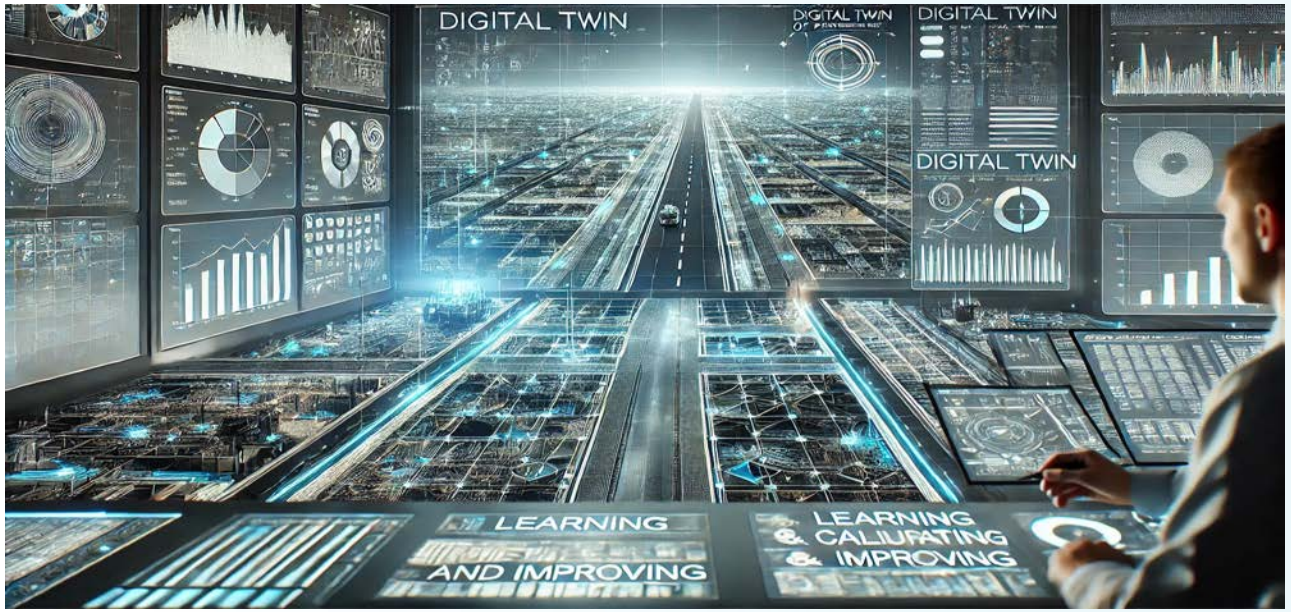
Pavement Management – Integrated and Intelligent (PMII)

Create a dynamic digital twin of pavement that seamlessly integrates diverse engineering data from the physical world into a virtual replica.

This digital twin will gain life of its own, capable of continuously learning, calibrating, and improving its predictive accuracy, enabling smarter decisions for pavement design, construction, and maintenance

Vision



Where to Begin?

In an Ever-Changing World:

- A vast array of options can be overwhelming.

- Constant changes can be too intimidating to act.

Find the Constant:

“In an exponentially changing world, focusing on things that do not change provides a strong foundation for long-term success.” (*Jeff Bezos*)

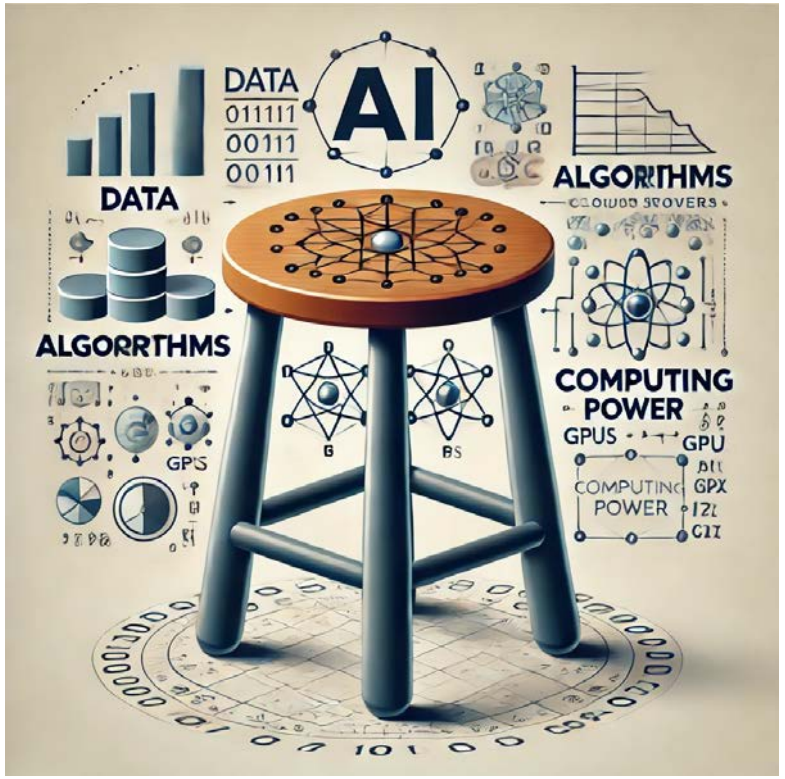
What are the things that are stable and foundational in the era of technology?

Constants

Data is Lifeblood of AI

Data is Fuel of AI engine

Integrate the Temporal, Multidimensional, and Cross-function Data by Breaking Down Data Silos



PMII – Four-Stage Life Cycle

1

Planning and Engineering: Collect geotechnical borings, drainage studies, and other preliminary data.

2

Design: Utilize Falling Weight Deflectometer (FWD), Ground Penetrating Radar (GPR), and coring data to define pavement structure and layer thickness.

3

Construction and Acceptance: Record mix designs, material testing data, core densities, and final acceptance data to ensure construction quality.

4

Maintenance and Operations: Document repair records, traffic data, and weather data to manage ongoing pavement performance.

PMII – Three-Legged Stool

Pavement

Create a digital version "twin" of the pavement with design and construction data, its DNA

Working Conditions

Create a digital version of its working condition with environmental and mechanical loading data

Performance

Create a digital version of its performance as characterized by "biomarkers"(cracking, raveling, rutting, smoothness, friction) during maintenances and operation.

PMII – A Roadmap

Architect the Platform

- Develop a robust GIS platform capable of integrating diverse data sets.
- Ensure data interoperability and real-time data updating capabilities

Digitalize - Create Digital Versions

- **Pavement Digital Twin:** Integrate design and construction data to create a digital representation of the pavement.
- **Service Conditions Digital Twin:** Incorporate environmental and traffic data to simulate service conditions.
- **Performance History Digital Twin:** Compile historical performance data to track and predict future pavement conditions

Develop Correlations and Causations through Machine Learning

- Implement machine learning algorithms to analyze the integrated data.
- Develop new models for design, impact analysis, and forecasting based on the identified patterns and correlations

Journey began

- Thanks to the Generosity, Partnership, and Stewardship from FDOT Technology Team;
- A Data Strategy is forming, An Initiative of data integration is under way.
- Are you ready to join and innovate for the next generation pavement management system?

Data Collection Technology for Pavement and Asset Inventory and Analysis

Chase Fleeman
Director of Operations
International Cybernetics Company

Data Collection Technology for Pavement and Asset Inventory and Analysis

Chase Fleeman

Director of Operations
International Cybernetics Company

FDOT

Data Collection Technology for Pavement and Asset Inventory and Analysis

Chase Fleeman, Director of Operations

INTERNATIONAL CYBERNETICS

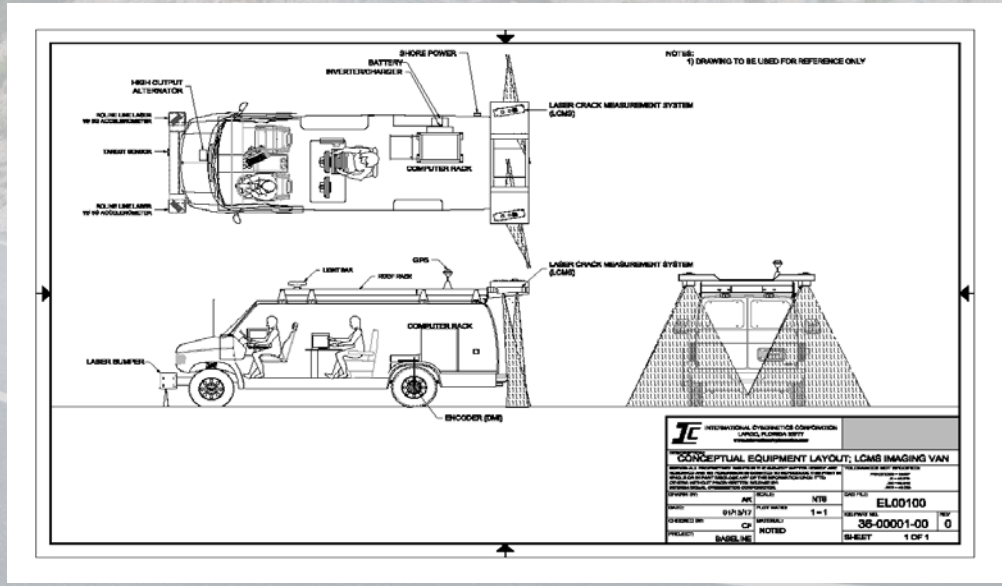
Who is International Cybernetics?

- Designer and builder of Road Survey Equipment since 1975
- 45+ years of proven experience and continuous innovation
- More than 775 clients in 72 countries
- Equipment used on 28,000,000+ miles worldwide
- Supplier to both private and public sectors. Customers include DOTs, MTOs, MPOs, major civil engineering firms, universities, and research institutes

INTERNATIONAL CYBERNETICS

ICC Design Approach

- Quality data is the foundation of good decision-making
- Equipment design can help or hinder collection of good data according to industry standards and best practices
- True integration: sub-millisecond synchronization between subsystems
- End-to-end workflows are supported in software
- Implemented DQMP-compliant practices in software
- Engineered for Ease of Use and designed with a safety-first Mentality
- Ruggedized Electrical and Mechanical Components
- Built with Operators Point of View



INTERNATIONAL CYBERNETICS

Data Collection Methods and Equipment

- **Inertial profilers**
  - HSP - High speed profiler
  - Reference
- **Right of way HD Imaging**
  - Fixed mount cameras
  - 360-degree spherical cameras
- **Pavement HD Imaging**
  - Pavemetrics LCMS-2
- **GPS and Inertial Navigation Systems**
  - GPS / DGPS Solution
  - INS / IMU Solutions
- **Lidar**

Inertial Profilers

- **HWP – High speed profiler**
  - Most commonly used for collection from 15-75 MPH
  - Equipment has fixed position mounting to vehicle
- **LWP – Lightweight**
  - Most commonly used for collection on construction projects post paving
  - Equipment mounted to ATV or UTV
- **ESP – Every Speed**
  - Most commonly used for municipal or county collections where constant stops and accelerations are required
  - Same advantages as HSP with the ability to stop and go during collection
- **Reference profiler**
  - Most commonly used for reference or ground truth data collection
  - Provides HD profilers for comparisons to other Class 1 devices

Right of Way Imaging

- **Fixed mount cameras**
  - HD 4K cameras (Basler Ace)
  - 1 to 6 cameras fixed mounted
- **360-degree spherical cameras**
  - HD 360º cameras (Flir Ladybug)
  - Camera is equipped with 6 cameras to generate a stitched panoramic images as well as endless virtual views.

360º Spherical Camera – Panoramic View

INTERNATIONAL CYBERNETICS

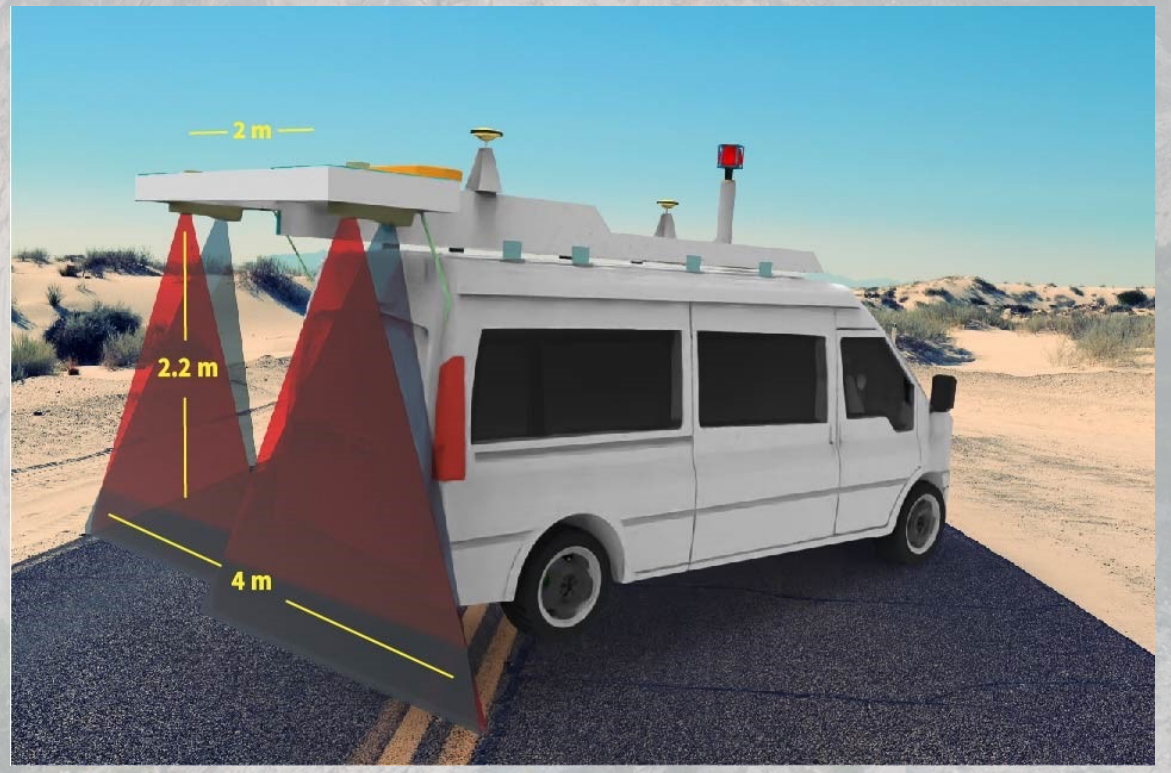
360º Spherical Camera – Custom Views

360º Spherical Camera – Custom Views

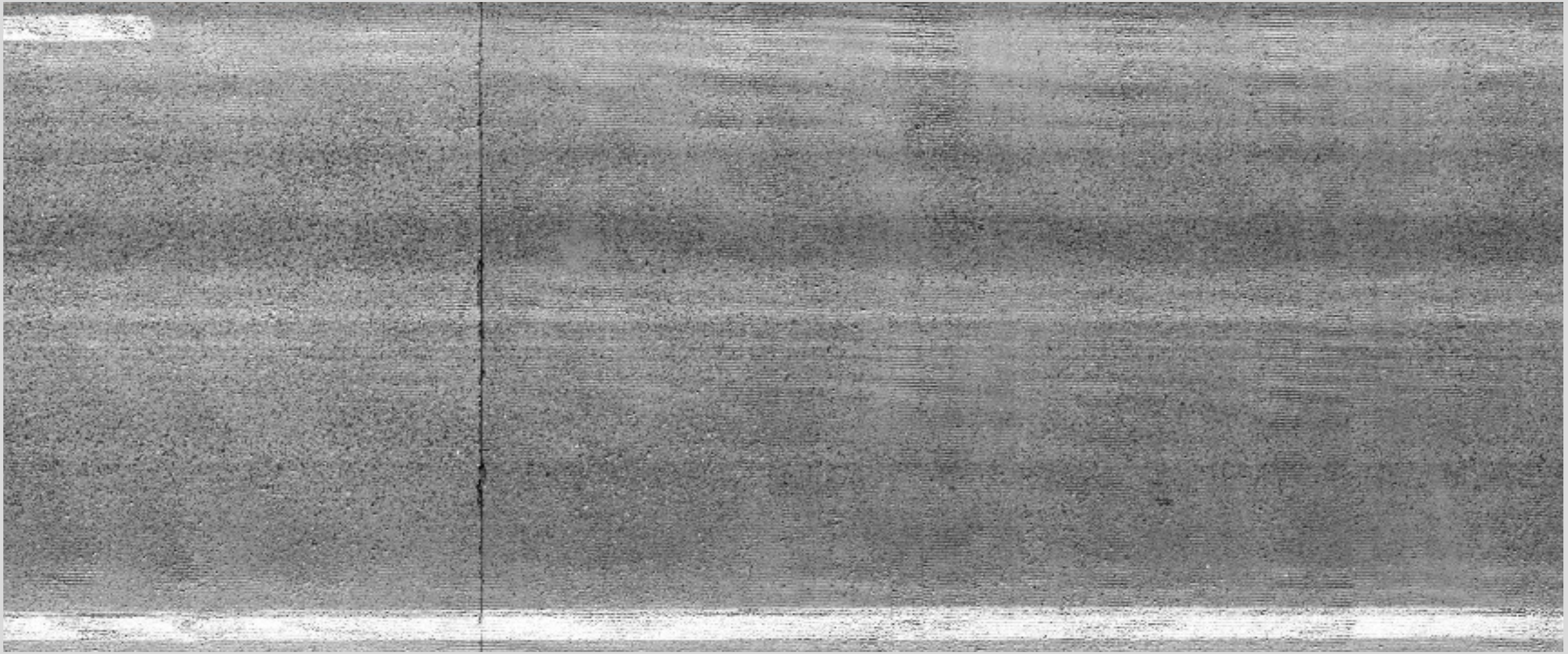
360º Spherical Camera – Difficult lighting conditions

Pavement Imaging

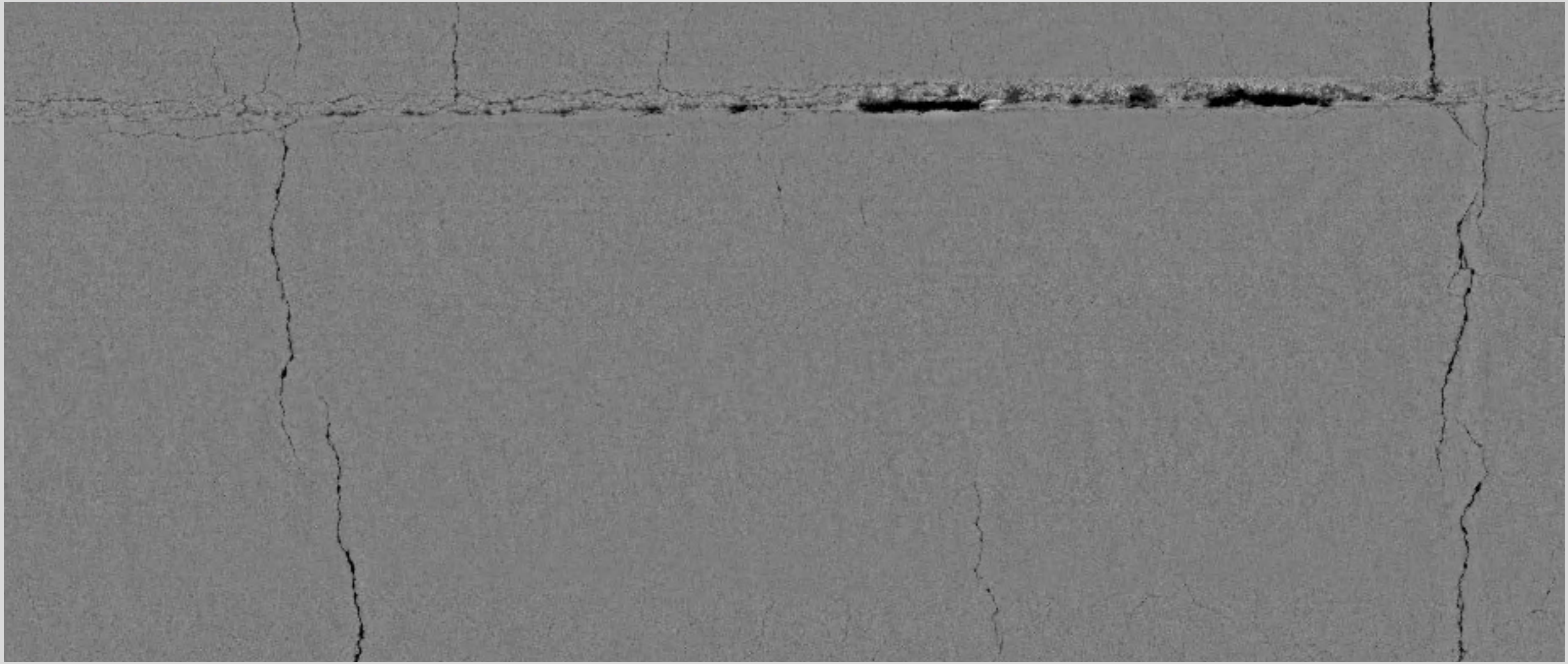
- **Pavemetrics LCMS-2**
  - 1mm x 1mm resolution
  - Highest resolution device on the market
  - Ability to rate and measure cracking and other surface defects
  - Joint detection
  - Fault height calculation
  - Ability to inventory each slab
  - Laser illuminated line on pavement to reduce shadows
  - Camera takes pictures of the line rapidly, triggered by vehicle forward motion and the individual profiles are stitched together into a 3D surface
  - 0.25mm vertical accuracy
  - 0.05mm vertical resolution



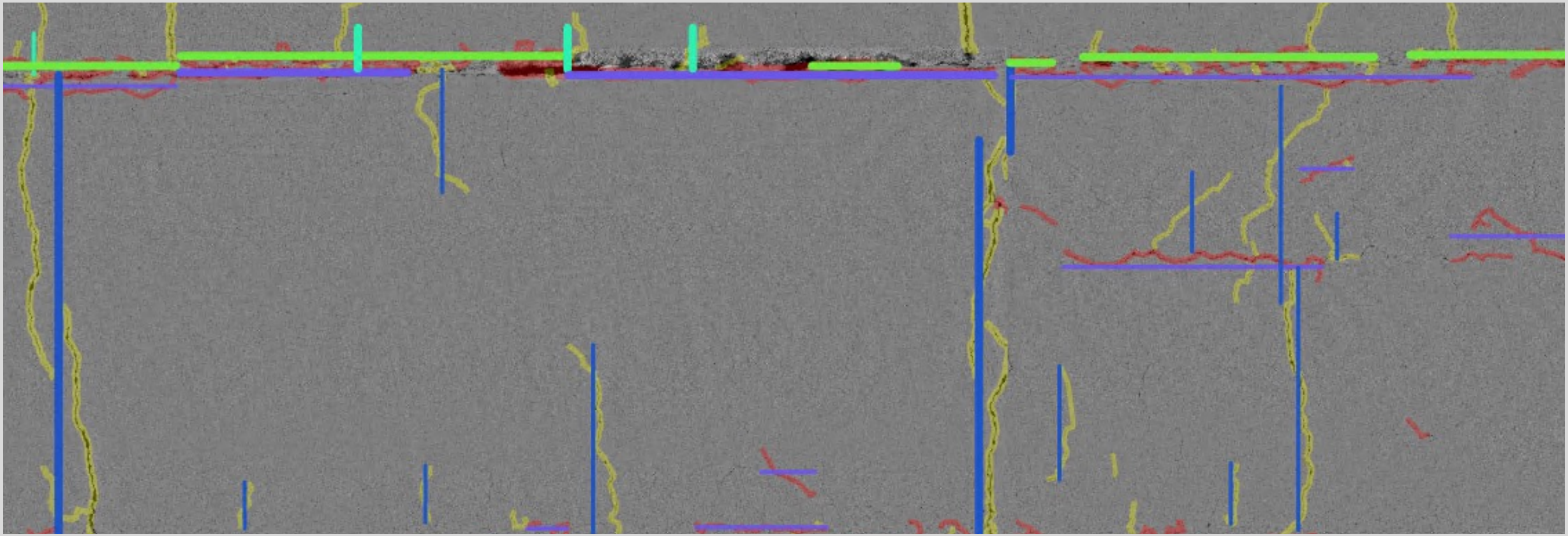
Pavemetrics LCMS – Intensity View



Pavemetrics LCMS – Range View

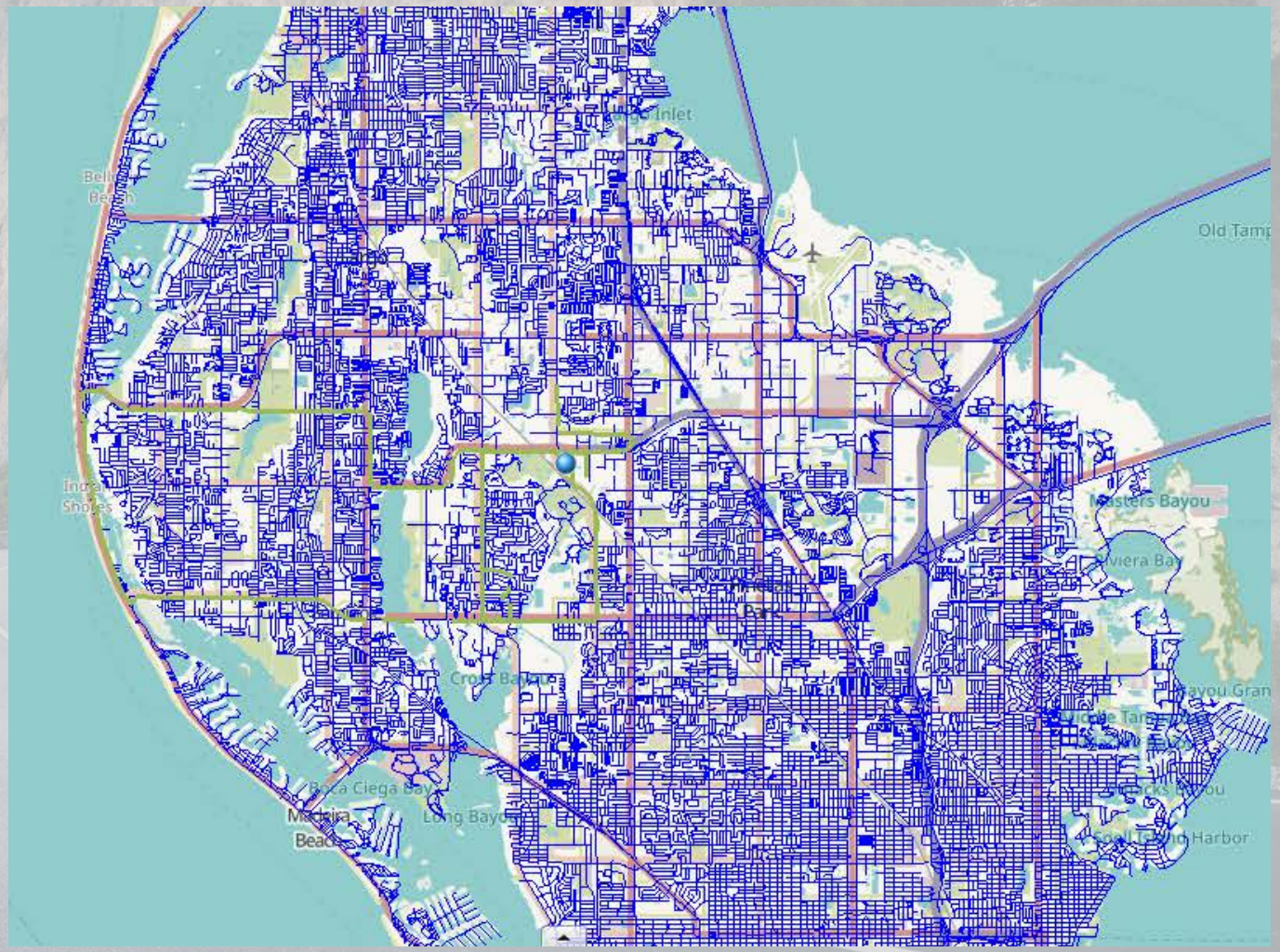


Pavemetrics LCMS – Crack overlaid on range image



GPS and Inertial Navigation Systems

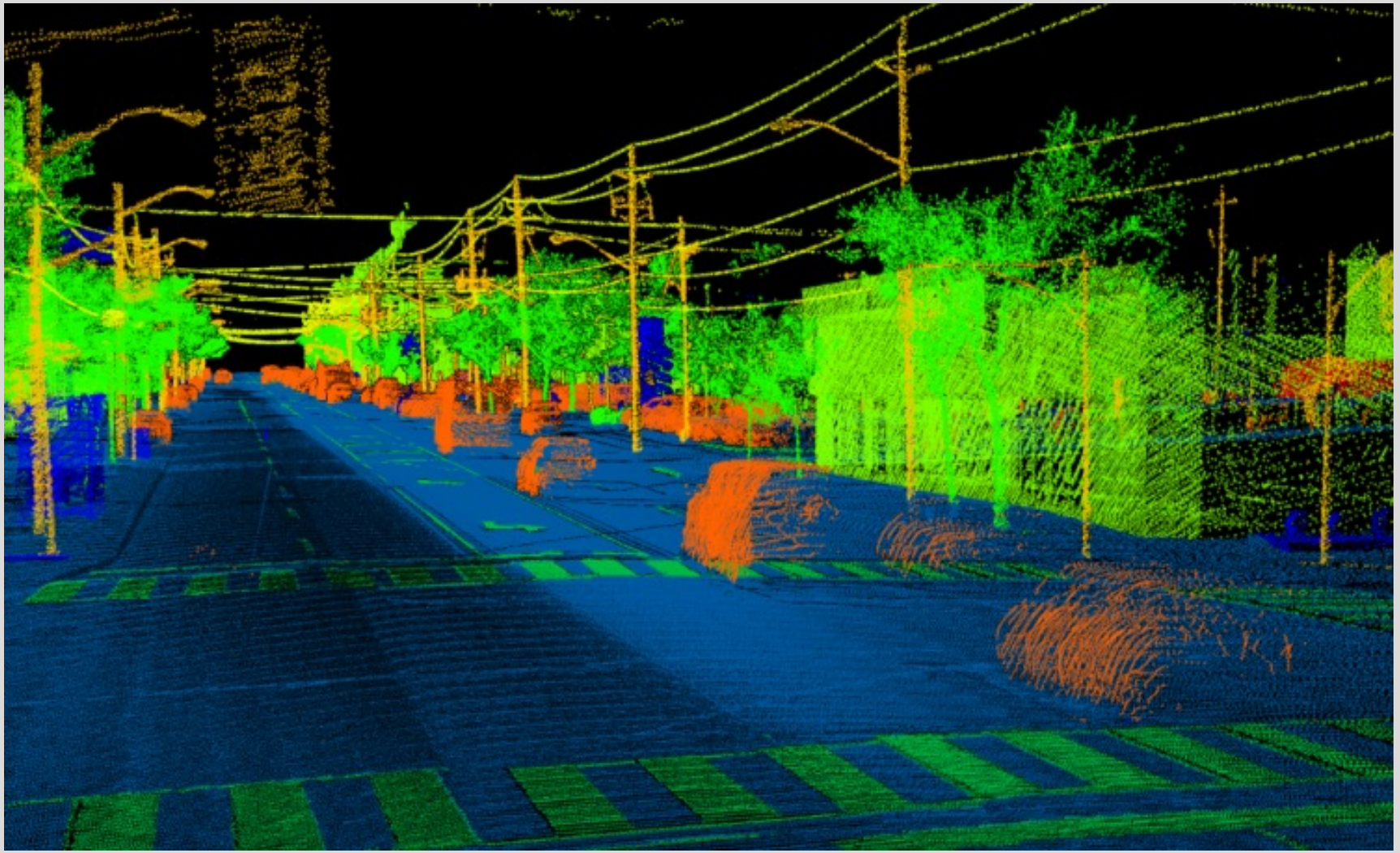
- **GPS / DGPS Solution**
  - Garmin and Hemisphere
- **INS / IMU Solutions**
  - iXBlue and Trimble Applanix



Lidar – Light Detection and Ranging Sensor

- LiDAR generates 3D models of the surrounding assets, capturing detailed features and elevations.
- LiDAR systems can cover large areas quickly, making them suitable for surveying road networks or infrastructure projects.
- LiDAR can penetrate through vegetation, capturing underlying pavement data even in areas with heavy foliage.
- LiDAR sensors can collect anywhere from 100,000 to millions of points per second.
- Consistency and accuracy of data is dependent on the sensor type with higher costs typically associated with better quality data

Lidar Point Cloud



Pavement and Asset Data for Connected / Autonomous Vehicles

Pavement and asset data collection can play a crucial role in the development and operation of connected and autonomous vehicles in several ways:

- Pavement and asset data provide the foundation for road networks and can be used to assist with development of onboard vehicle software.
- Knowing the condition of the pavement would allow CAVs to optimize routes that minimize wear and tear on the vehicle. For electric vehicles, smoother roads also mean better energy efficiency.
- Data on roadside assets like charging stations, parking meters, and public transport hubs can help CAVs plan routes that optimize these interactions, reducing energy consumption and increasing convenience.
- By continuously monitoring pavement and asset conditions, cities can plan when and what maintenance is required, leading to more efficient use of resources and minimizing disruptions to CAV operations.
- Asset and pavement data can help DOTs and municipalities ensure that roads and related infrastructure meet safety standards for CAVs, contributing to regulatory compliance and supporting the deployment of autonomous vehicle technology.

Thank You

Chase Fleeman

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2024 FAV Summit: Modernizing Data Solutions

Questions?

Moderator: Glendora Fortune, PMP, CPM, CSM, FCCM

Chief Information Officer, Florida Department of Transportation

Data Collection Safety Tips

BE SEEN: *Always wear safety vests and ensure vehicles are equipped with high intensity amber or white strobe warning lights that rotate, flash, oscillate.*

BE PREPARED: *Make sure vehicles, equipment, and tools are available and in working condition before every trip.*

BE AWARE: *Plan ahead for traffic and weather conditions when doing work or performing field visits.*

2024 FAV Summit: Modernizing Data Solutions

Thank You!

Moderator: Glendora Fortune, PMP, CPM, CSM, FCCM
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