NATIONAL ACADEMIES Sciences Engineering Medicine

TRB TRANSPORTATION RESEARCH BOARD

TRB Webinar: National Digital Infrastructure Strategy and Roadway Operations Data Exchanges

December 1, 2023

1:00 – 2:30 PM

PDH Certification Information

1.5 Professional Development Hours (PDH) – see follow-up email

You must attend the entire webinar.

Questions? Contact Andie Pitchford at TRBwebinar@nas.edu

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Program. Credit earned on completion of this program will be reported to RCEP at RCEP.net. A certificate of completion will be issued to each participant. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the RCEP.

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REGISTERED CONTINUING EDUCATION PROGRAM

Purpose Statement

This webinar will explore the status and nature of this evolving strategy, and its context for Roadway Operations Data Exchanges (RODx) and platforms to enable vehicle-roadway connectivity. Presenters will provide diverse industry perspectives to illustrate the technologies and systems techniques that are offering near-term solutions.

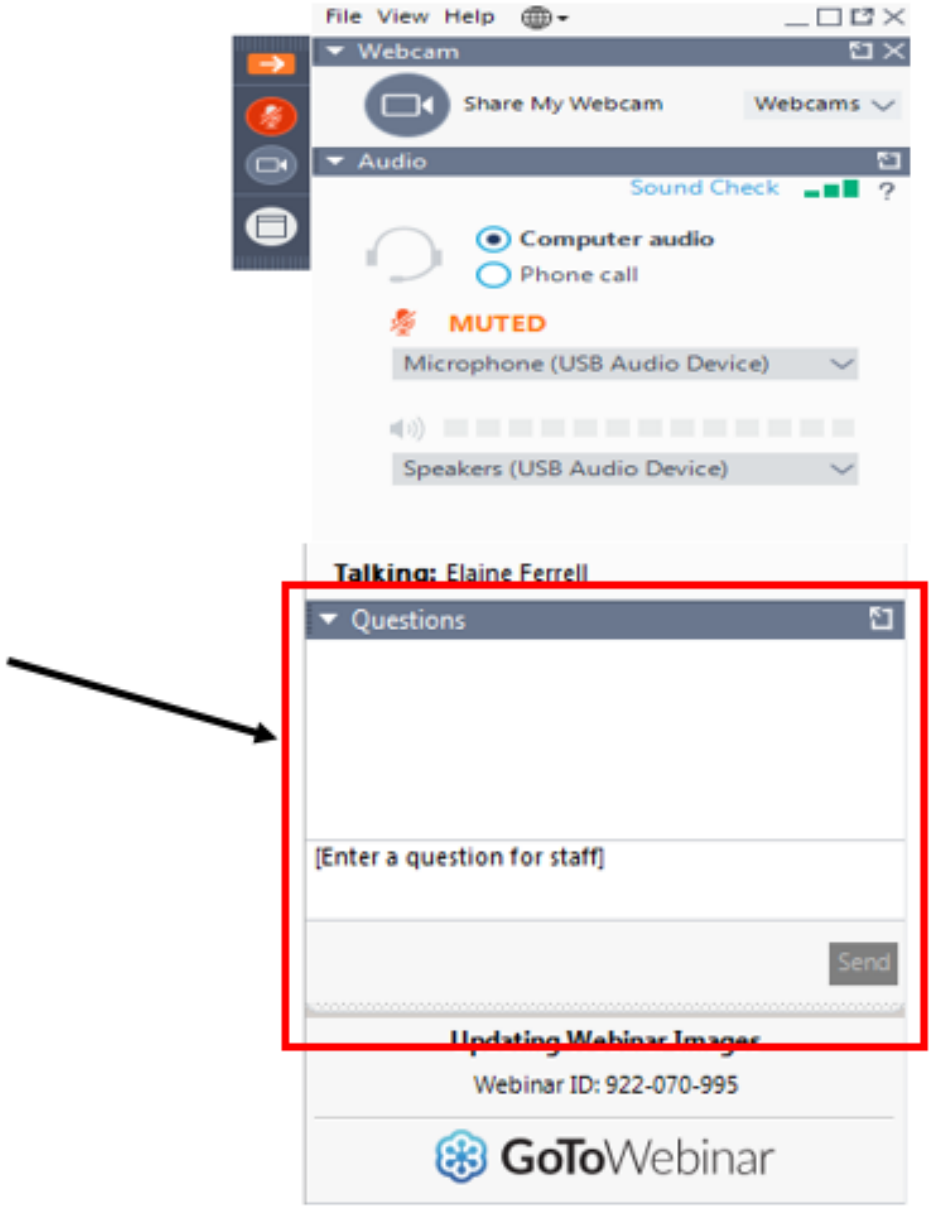
Learning Objectives

At the end of this webinar, you will be able to:

- Identify current initiatives and organizations contributing to creation of a National Roadway Network Digital Infrastructure Strategy
- Establish how RODx and platforms for vehicle-roadway data integration can contribute to this strategy
- Identify critical issues and opportunities associated with roadway network deployment of RODx at the national scale

Questions and Answers

- Please type your questions into your webinar control panel
- We will read your questions out loud, and answer as many as time allows



Today's presenters

John Corbin
john.corbin@dot.gov
Federal Highway Administration

Deepak Gopalakrishna
Deepak.Gopalakrishna@icf.com
ICF

Virginia Lingham
virginia.lingham@icf.com
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Sue Bai
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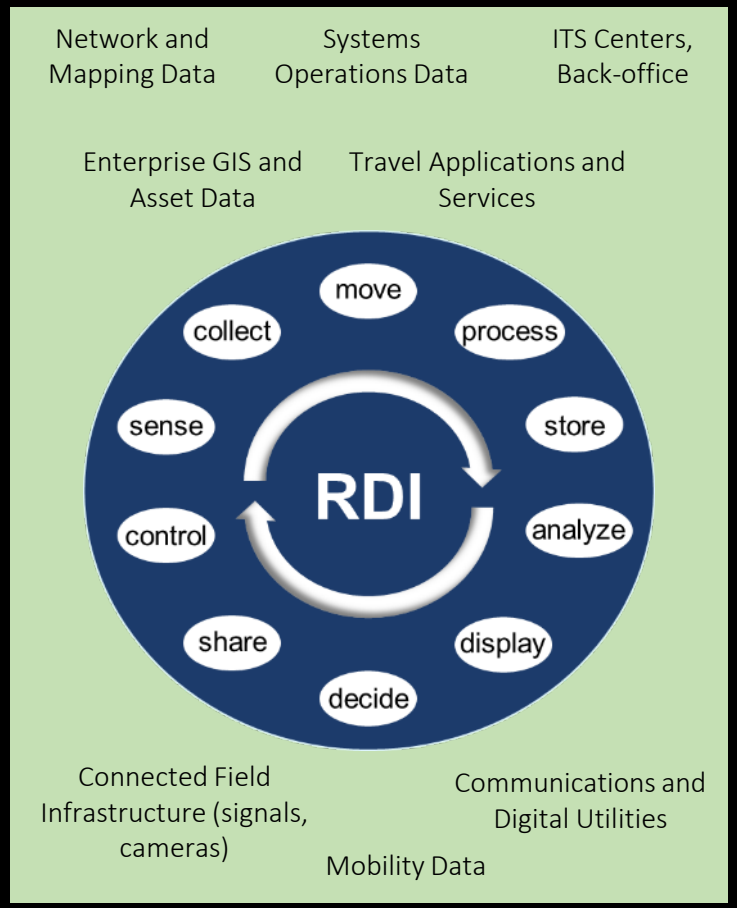
Honda

Dean Deeter
deeter@acconsultants.org
Athey Creek Consultants

Evolving National Roadway Network Digital Infrastructure (DI) Strategy

Deepak Gopalakrishna, ICF

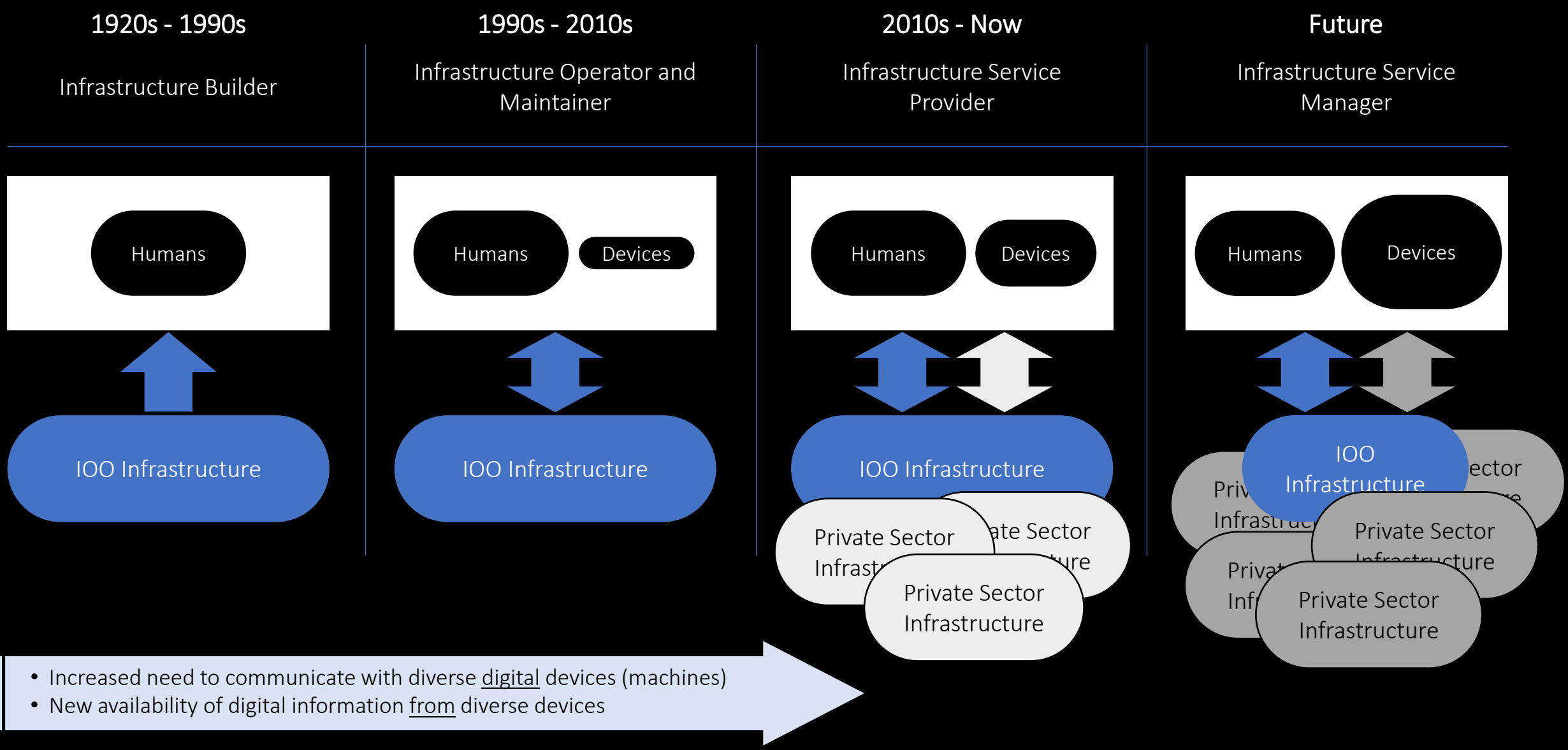
What Is Roadway Digital Infrastructure (RDI)?



Collective public and private technology assets that create, exchange, or use data or information to improve the transportation system by the provision of existing and new services for travelers, businesses, and agencies.

RDI is not just data. It includes all the assets that generate, move, process, and display data and information that support end user usage of the generated information.

From an Analog to a Shared Digital Future



Roadway Digital Infrastructure Evolution from ITS

	20th Century (The ITS Program)	21st Century (Roadway Digital Infrastructure)
Infrastructure	• Centralized device-to-device • Government networks	• Spectrum and technology • Edge and Cloud • Vehicle-roadway sensors and crowdsourcing • Government and industry networks
Institutional Approach	• Government owned/operated • Civil engineering led • Conventional procurement • Device & component deployment	• Public-private business models • Cross-disciplinary: technical, legal, financial • Innovative procurement and partnerships • Infrastructure and insights as a service • Transitions between government digital services versus private offerings
Policy Context	• Vehicle-based mobility and safety	• Safe system context • Vehicle-roadway integration • User-oriented accessibility • Sustainable community connectivity • Nationally synchronized and market-driven

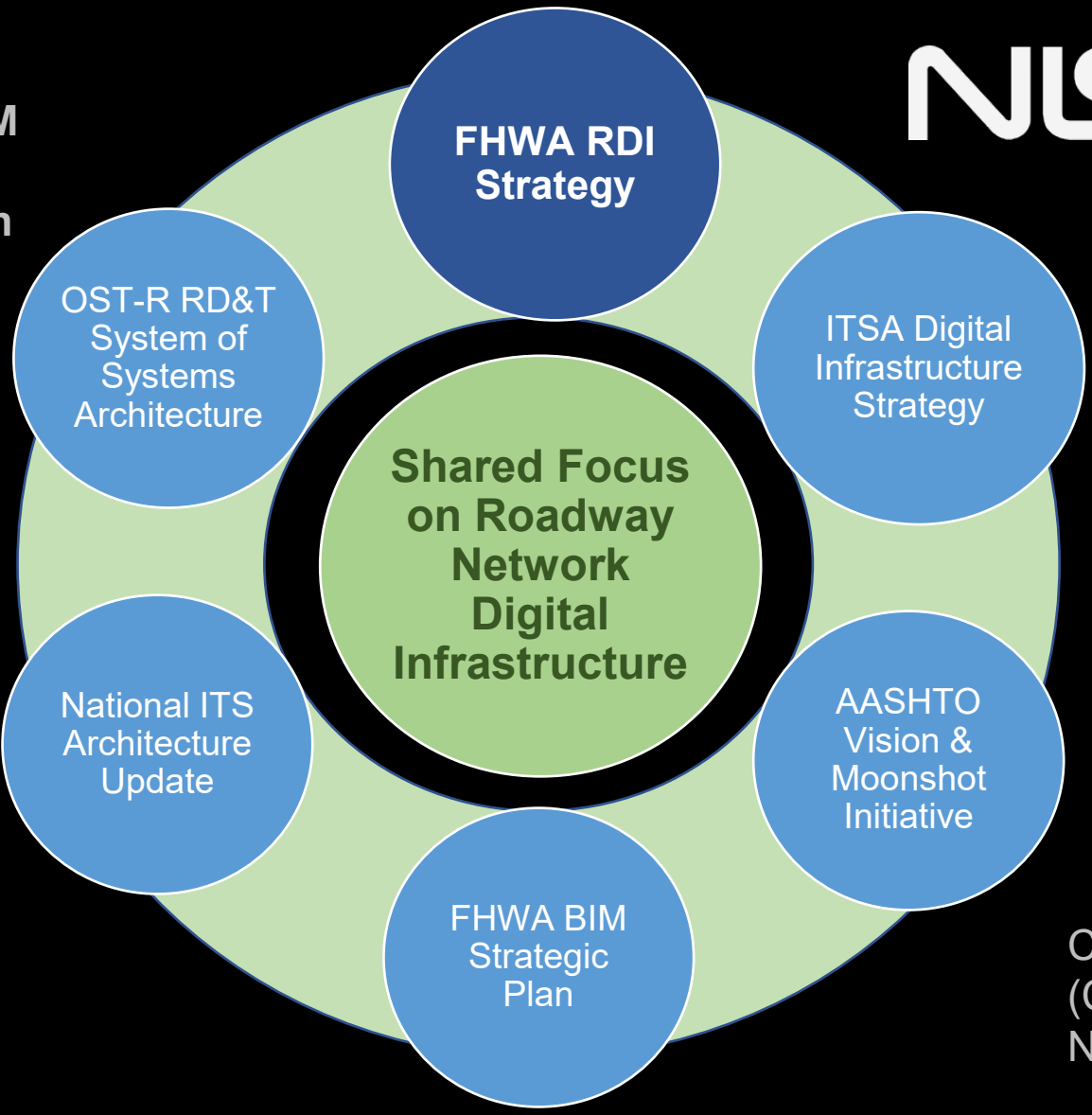
A Renewed and Shared Strategic Focus on Roadway Digital Infrastructure

USTRANSCOM United States Transportation Command

Joint Office of **Energy and Transportation**

National Electric Vehicle Infrastructure (NEVI) Formula Program

EMERGING ISSUES IN NEW MOBILITY
SAE EDGE™
RESEARCH REPORT



NIST

U.S. Government National Standards Strategy for Critical and Emerging Technology

Standards and Performance Metrics for On-Road Automated Vehicles Workshop

White House AI Initiatives

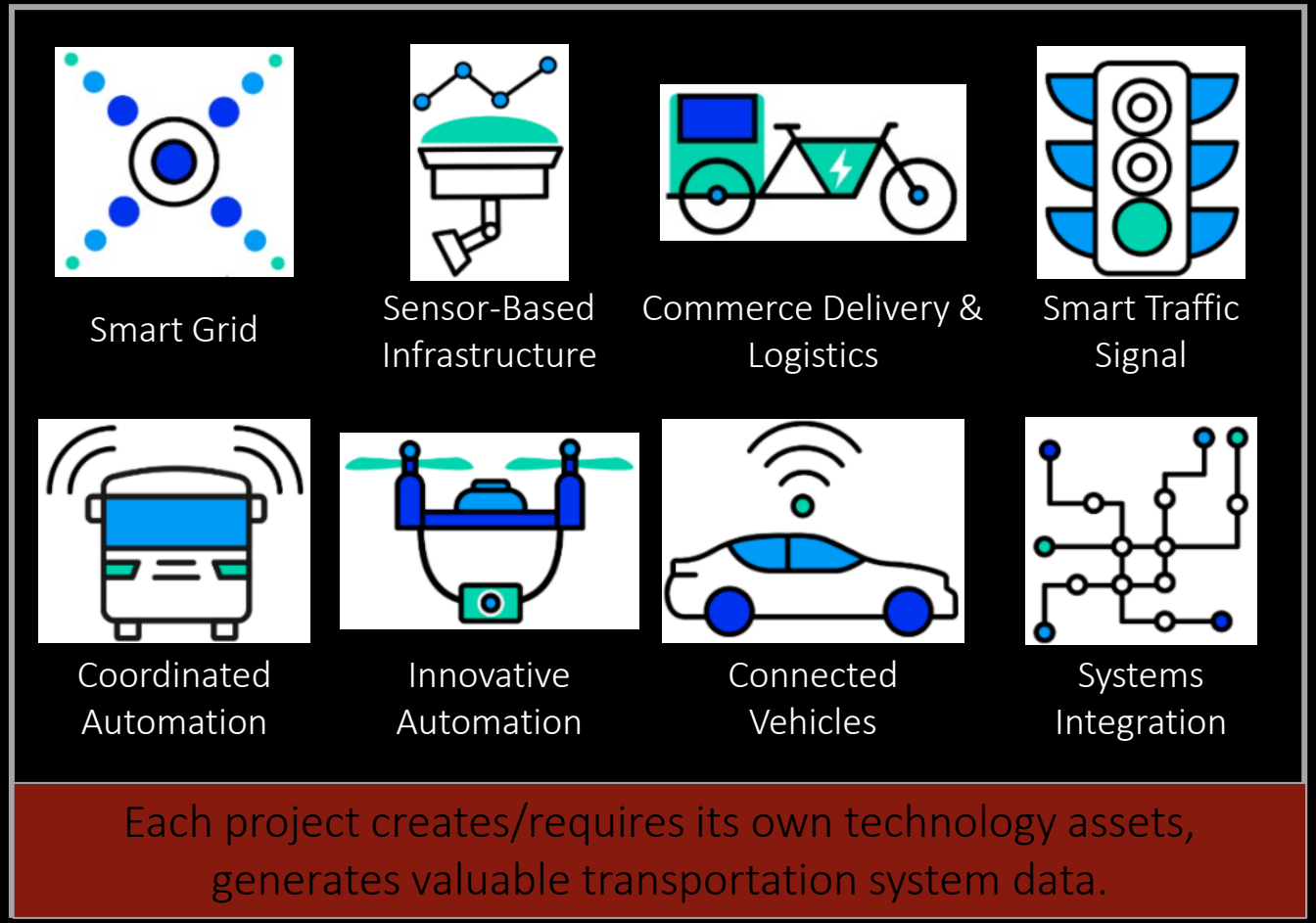
(Anticipated) Executive Order
AI Bill of Rights

CSA GROUP

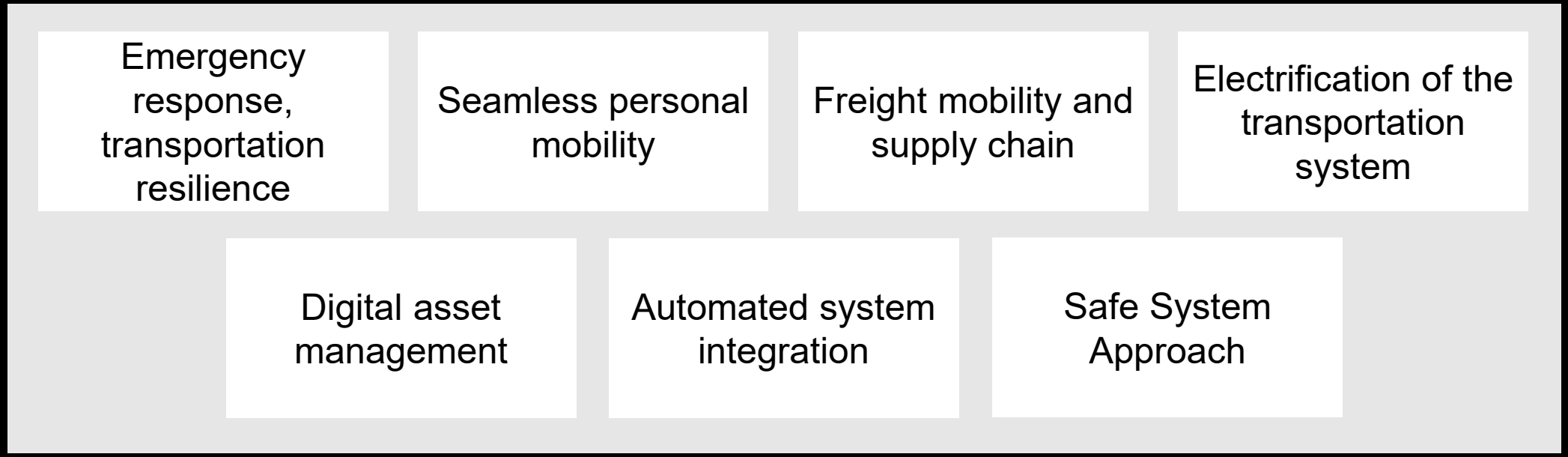
Connected and Automated Vehicle (CAV) Infrastructure Guidelines for North America

National Strategy for RDI: A unique opportunity in time

- An unprecedented investment in transportation technology projects for at least the next five years.
- **Clear direction on how to effectively source, integrate and manage RDI at the national scale is needed NOW.**

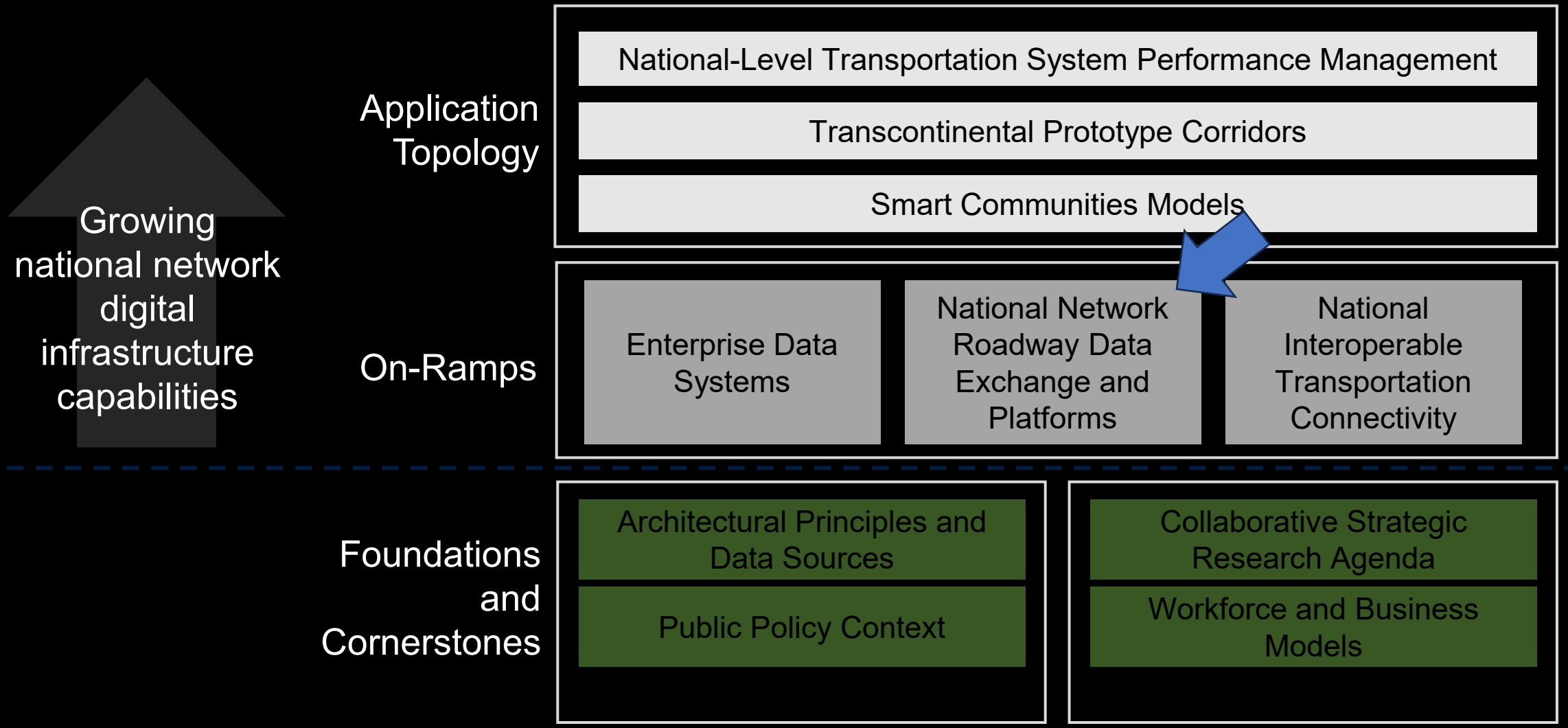


RDI Supports National Transportation Priorities



National, interoperable, consistent roadway digital infrastructure—
that goes beyond today's piecemeal approach to delivering digital services—
dramatically improves our ability to deliver on these priorities.

National Roadway Network Digital Infrastructure: A Possible Approach

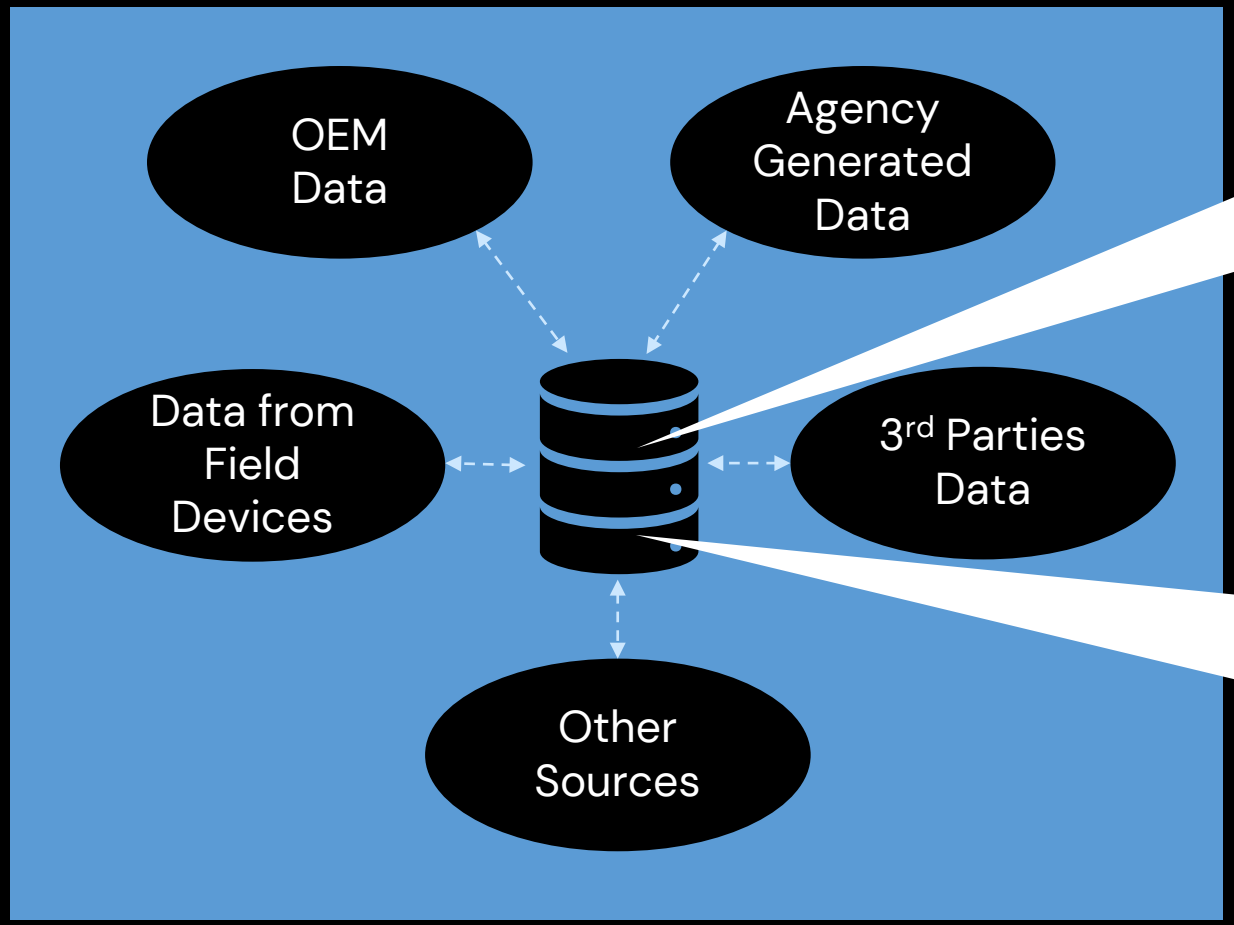


National Network Roadway Operations Data Exchanges (RODx)

Virginia Lingham, ICF

Background and Context

Typical DOT Data Sources and Types of Data



DOT use of the data:

- System performance and safety
- Investment planning
- Emergency/incident response
- Asset management
- Others…

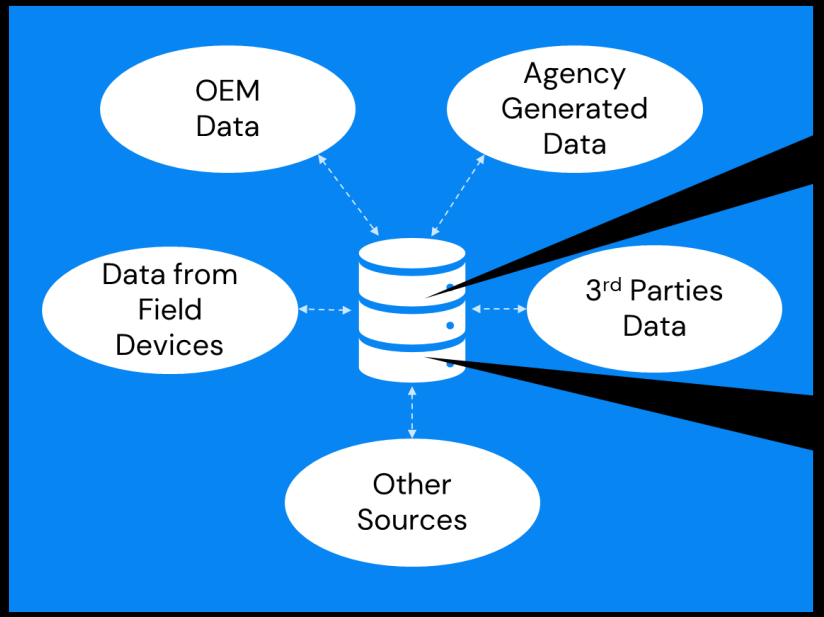
External use of the data:

- Support Automation
- Support freight / supply chain logistics
- Travel information
- Safety applications
- Others…

Background and Context

- Previously, state DOT and traveler needs were mostly localized
- Now, we are envisioning regions and transcontinental corridors
- We also a vibrant and growing private sector providing information, mapping and travel services.
- **Is there a business model for the sharing of these data?**

Data Type Examples:
- Work Zones
- Incidents
- Closures
- Weather
- Traffic Regulations
- Truck Parking
- Vehicle Telematics

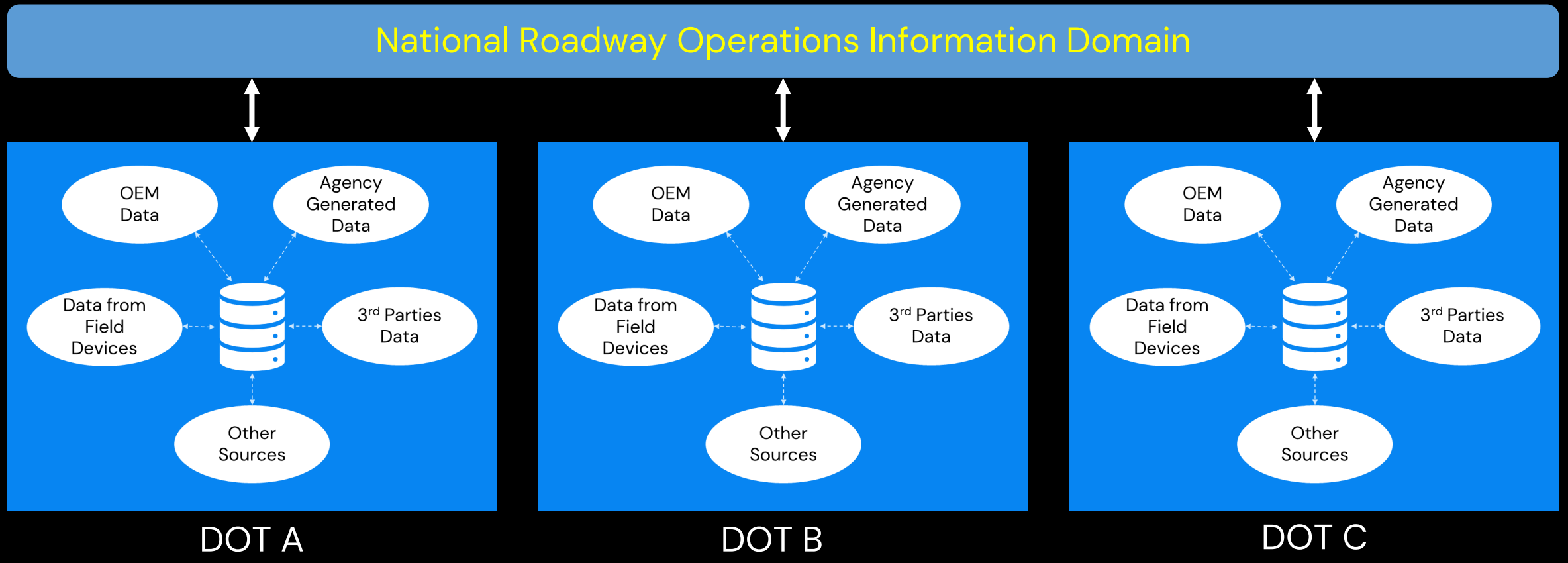


DOT's use of the data:
- System performance and safety
- Investment planning
- Emergency/incident response
- Asset management
- Others…

External Users use of the data:
- Support Automation
- Support freight / supply chain logistics
- Travel information
- Safety applications
- Others…

Institutional and Business Model Advancements

Is there a need for a more formalized national roadway operations information domain for more explicit interoperability, sharing, co-evolution?



What do we know?

All these data exchange models and activities have commonalities:

- Multi sensor, multi source (e.g., require conflation, concerns include data governance, quality, security, privacy, etc.)
- These are not static “one and done” deployments – they require ongoing operations, modifications, changes, etc.
- The content to be shared is continuously growing and expanding – future data needs we don’t yet know about.
- Industry confusion about key terms (data exchange, data lake, data environment)

What do we know?

Private sector data products are available and likely are the most convenient for IOOs to purchase.

- These data sources have gaps (e.g., work zones, workers presence, etc.)
- Business models are still evolving
- International policy and technology developments can impact U.S capabilities

There seems to be an industry disconnect. There is the need and willingness to advance national data exchanges, but we don't have the institutional glue/mechanism to do so?

What are we missing?

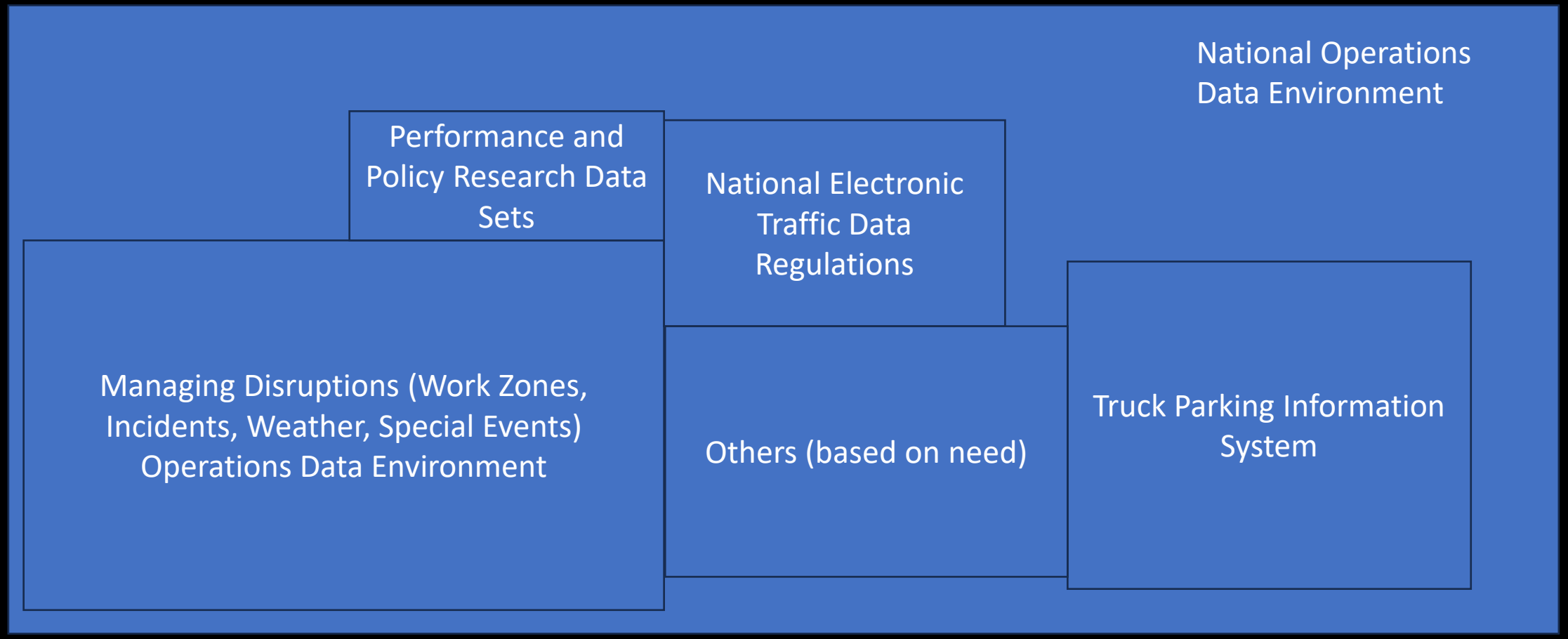
We have traditionally relied on national public sector-driven standards development and other public initiatives.

The rapidly changing nature of data, technologies and use-cases makes it difficult for these to form the glue to hold it together, however:

- GTFS, MDS, CDS is a good example of rapid evolving collaborative specification development
- WZDx is a good example of rapid evolving specification development
- We need a way to collaboratively (public, private) work and maintain these new standards

Is there a need for a more formalized national roadway operations information domain for more explicit interoperability, sharing, collaborative development and maintenance of critical specifications?

National Network Roadway Operations Data Environments



Empowering People to be Part of Building a Better and Safer Roadway

SUE BAI
Chief Engineer, Chief of Data Business

HONDA
The Power of Dreams

Contents

- **Safety Vision**
- **What's Next: Share the ownership and joy of building a better and safer roadway**
- **Closing Remarks**

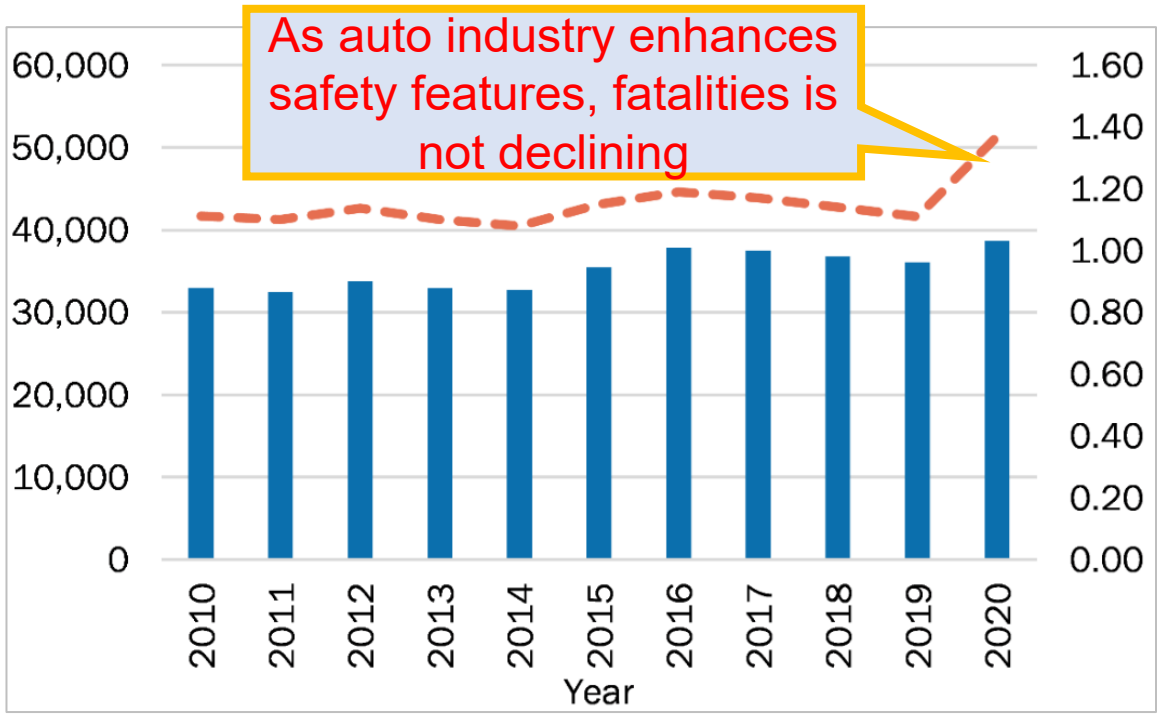
Soichiro Honda's Approach to Safety

"Respect for human lives" & "Proactive pursuit of safety"

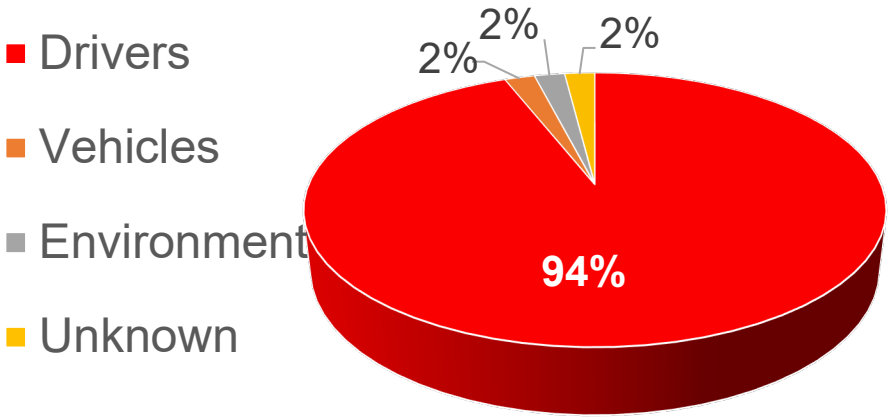
"Everyone involved in the transportation system must respect human lives."

Transportation Safety Challenges and Reality in the U.S.

US Traffic Fatality and Fatality Rate



Critical Reasons Attribute to Traffic Fatality



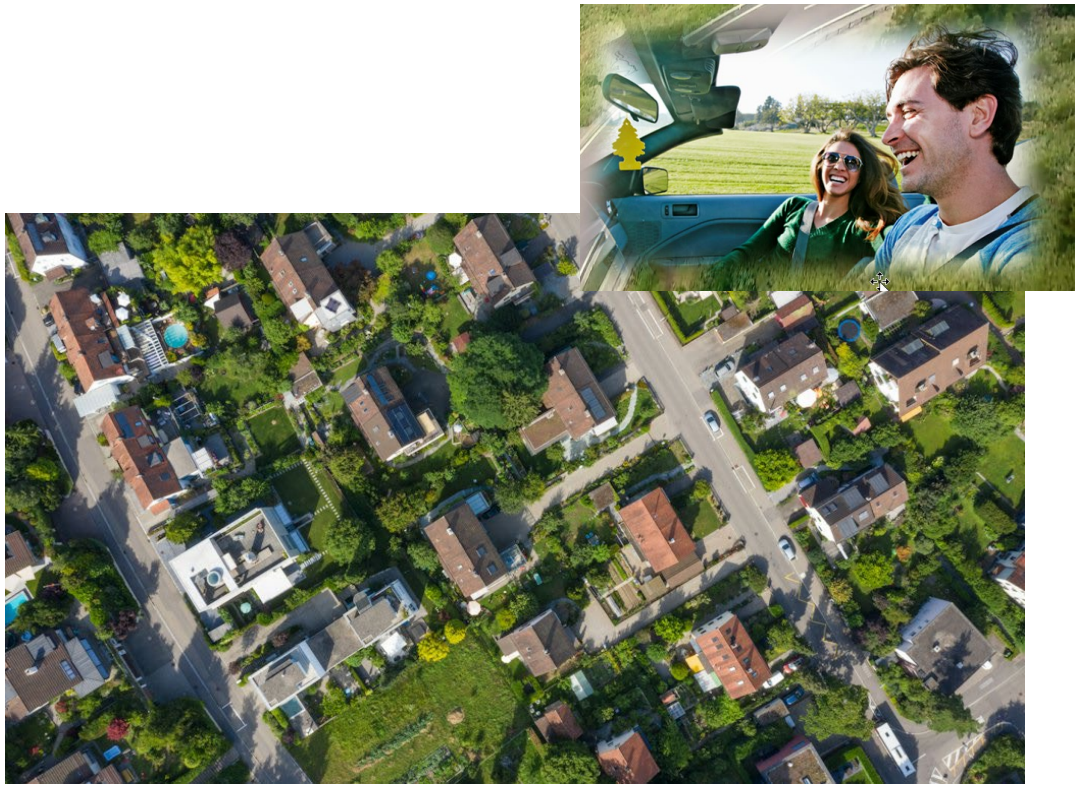
Driver Related:

- Recognition Error
- Decision Error
- Performance Error
- Non-Performance Error (Sleep, etc.)
- Other

Human Behavior is the leading cause of traffic fatalities in the US

Driving Behavior Gap

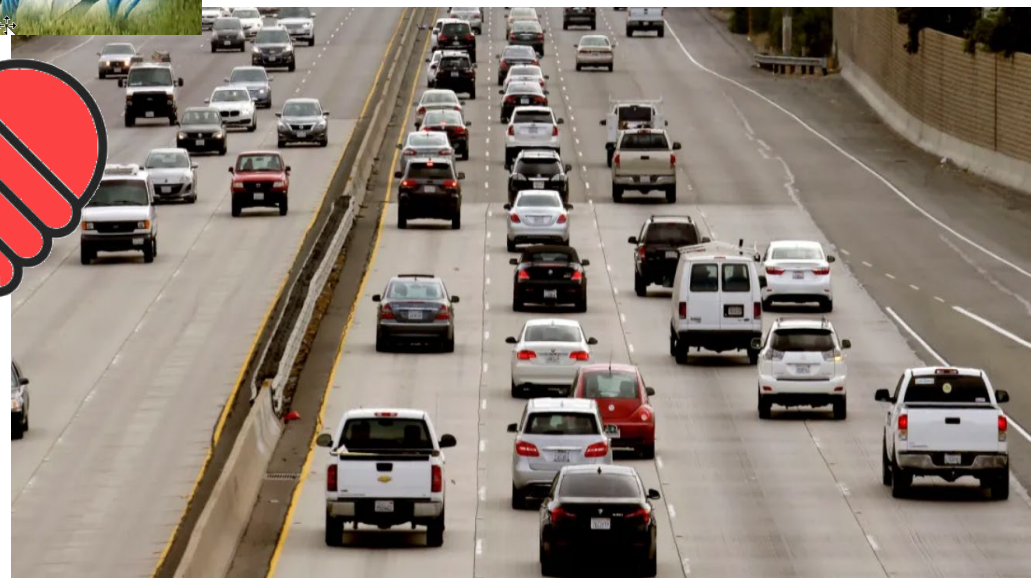
Well-behaved in neighborhood



Aggressive driving outside neighborhood

What if We Extend this Environment?

Good driving behavior



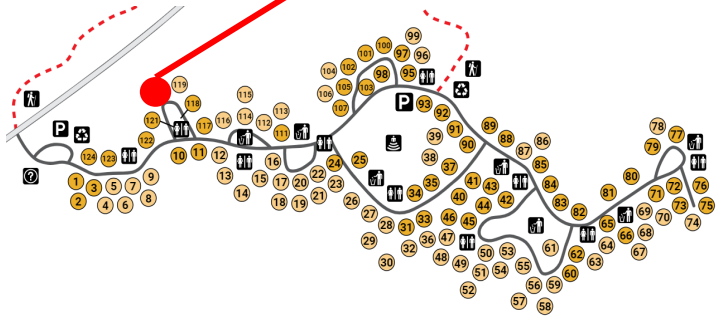
Solution Idea Learned from US National Park System

So clean and well-maintained!

Sue's camping site

"FOR THE BENEFIT AND ENJOYMENT OF THE PEOPLE"

Yellow Stone National Park, the 1st National Park (1872)



Joshua Tree Park Campground map

Value: The Benefit and enjoyment of the people

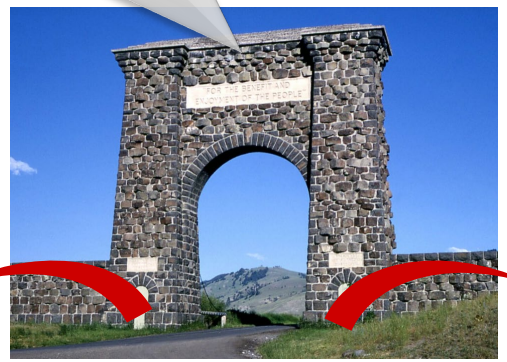
What: Appreciation & Sense of Pride

Why:

- **Shared ownership & responsibility → It is MY park**
- **Sense of community → Group of nature lovers**
- **Sense of pride → Feel good about keeping it safe and clean**

Make Road as Appreciated as National Park

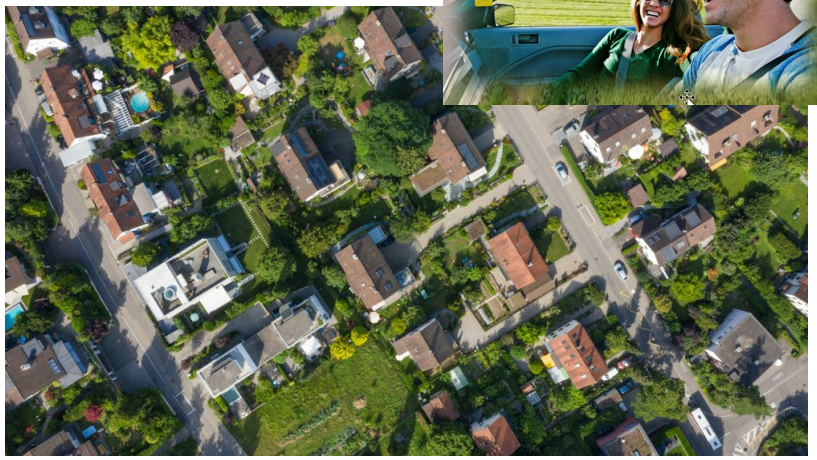
"FOR THE BENEFIT AND ENJOYMENT OF THE PEOPLE"



Neighborhood Good Driving

Value: The Benefit and enjoyment of me and my neighbors
What: appreciation & sense of pride
Why:

- **Shared ownership & responsibility → It is MY home**
- **Sense of community**
- **Sense of pride → Feel good about keeping it safe and clean**

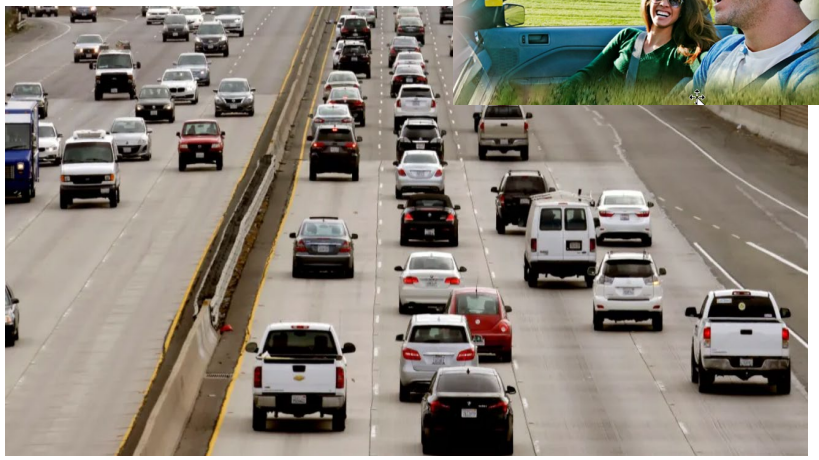


Honda is the enabler!

Everywhere Good Driving

Value: The Benefit and enjoyment of the riving community
What: appreciation & sense of pride
Why:

- **Shared ownership & and responsibility → It is MY road**
- **Sense of community → Group of more engaged drivers**
- **Sense of pride → Feel good about keeping it safe and clean**



One Way of Achieving It:

Driver Frustrated by Road Hazard

Someone else's job to fix it!

More Engaged Drivers

Appreciation and Pride

Vehicles Detect Hazard

Inform Road Operators

Safer and Better Roads

Collaboration with Ohio Department of Transportation

Ohio Department of Transportation Taps Honda to Lead Two-year Project to Advance Road Condition Management System

RELEASE PHOTO

November 9, 2023 — COLUMBUS, Ohio

https://www.youtube.com/watch?v=d17_rVID1fE

Honda Road Condition Management System Graphic

Positive Cycle for a Safer and Better Driving Environment

Shared ownership

More Engaged Drivers

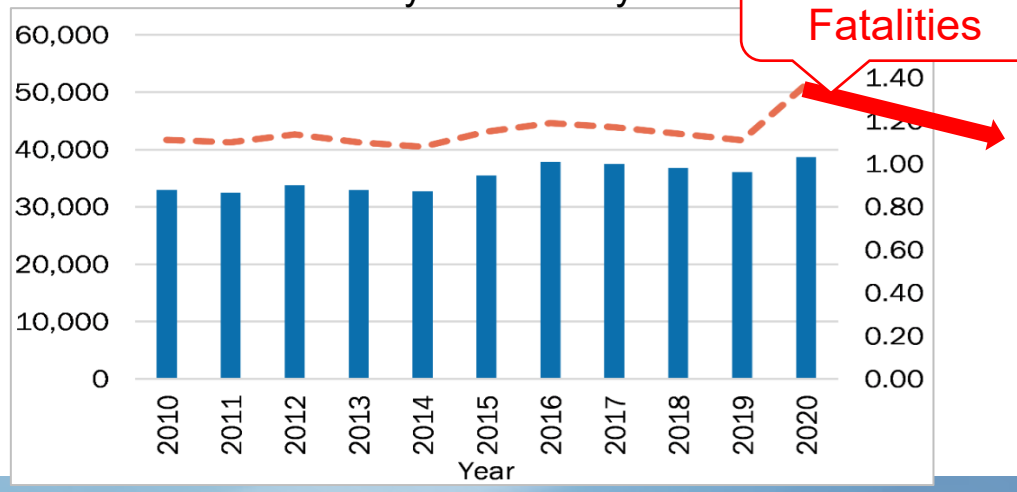
Appreciation & Pride

Better Driving Behavior

Safer

US Traffic Fatality and Fatality Rate

Toward Zero Fatalities



Better Roadway Operation

Better roadway experience

<u>Better Driving Behavior</u> leads us closer to the Zero Fatality goal

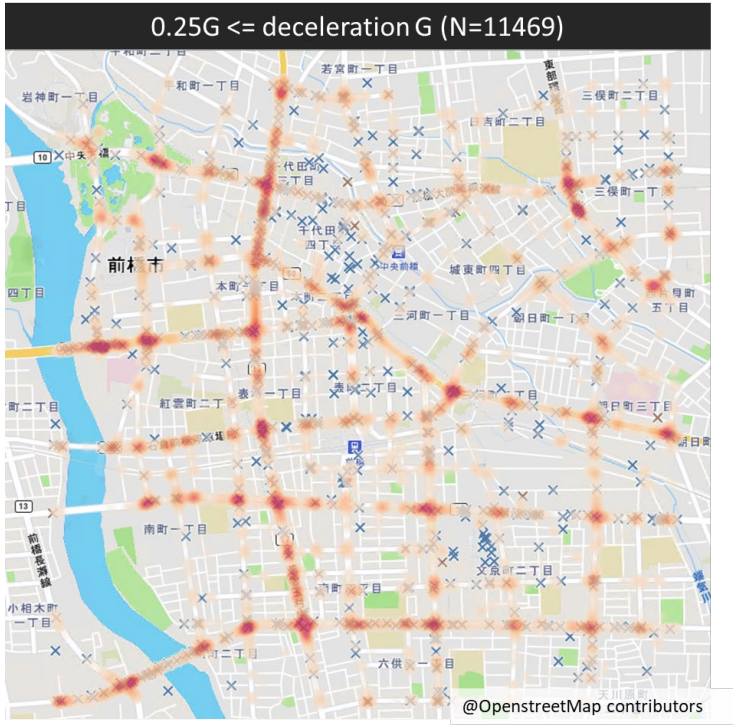
Traffic safety with city planning

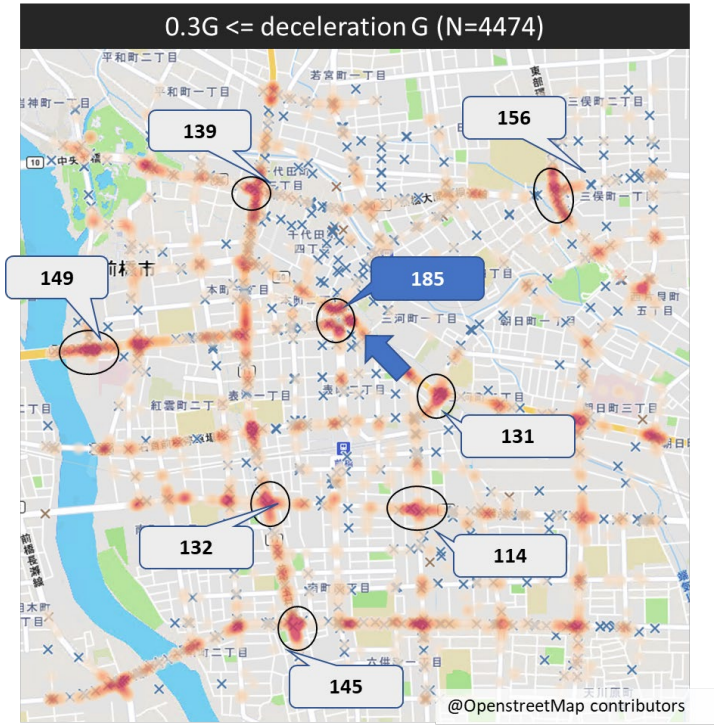
Client's needs

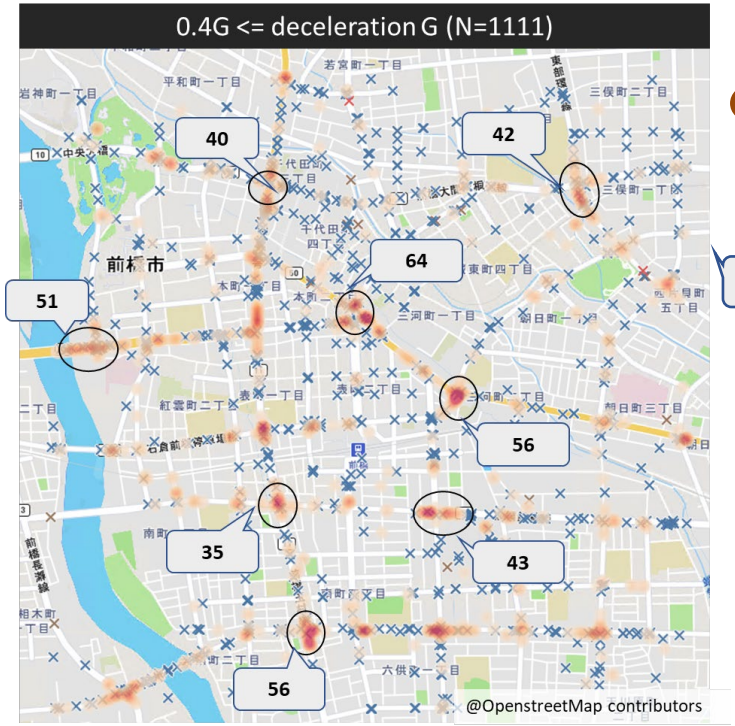
To develop optimal city planning, we'd like to analyze roads to understand the risky points.

Solution

Plotting the emergency braking points and accident occurring points on the map.







Emergency braking points

Traffic accident points

n Number of emergency braking

There are too many data points, and almost all of the intersections are defined as risky points.

Higher deceleration G threshold

Higher deceleration G threshold

expose real risky point of traffic accident

Success Story: We Improved Traffic Safety!

Frequent emergency braking locations

Before

After

Pruned trees to improve visibility

Speed control marking on pavement

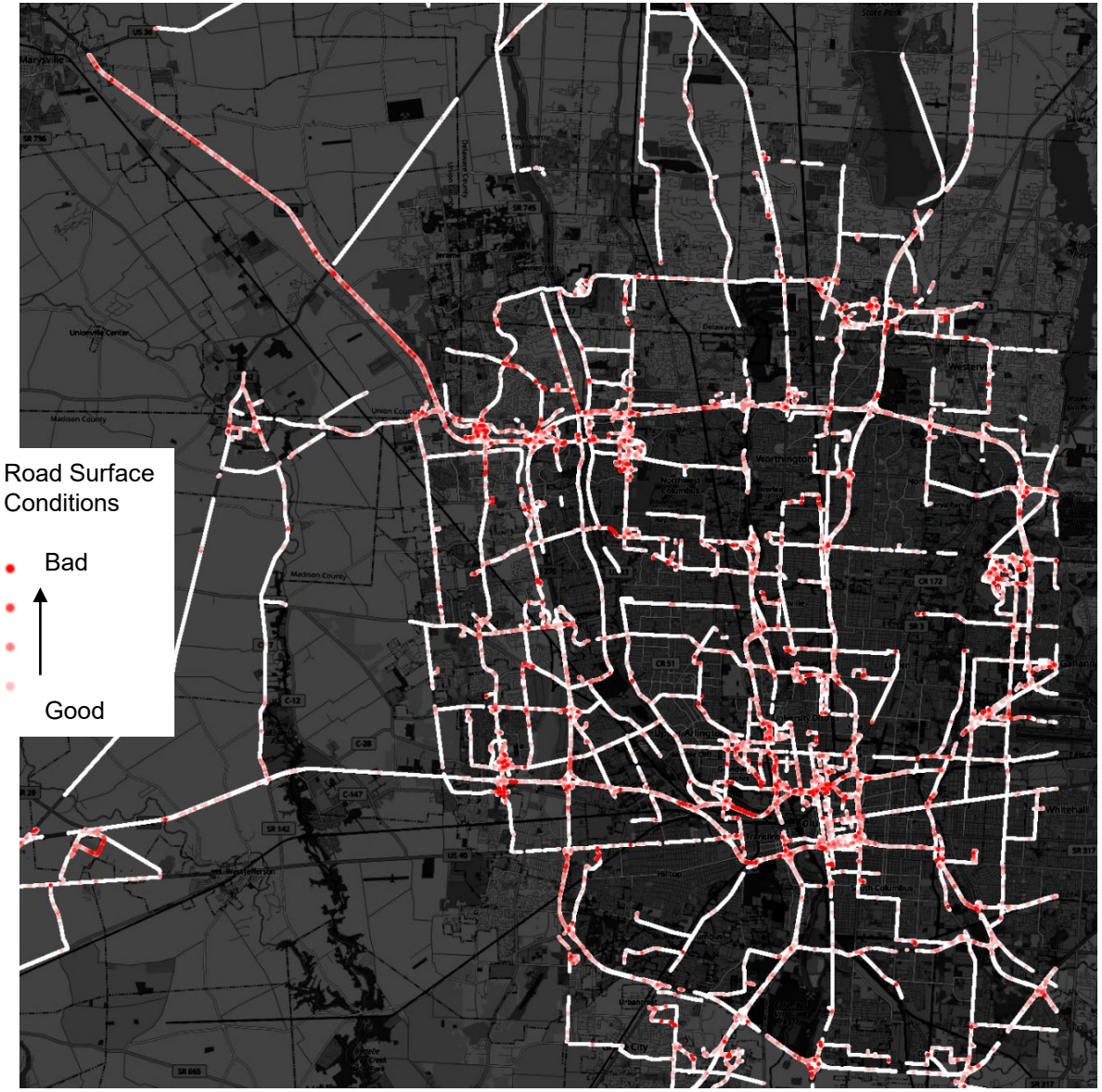
Result

Hard braking reduced by 1/3

3rd advanced policy
Grand Prize Winner
Of National Governor's Association

Honda has the technology and is already making a difference

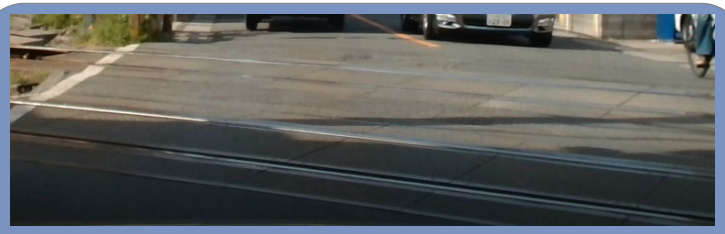
Analysis Result of Road Surface Roughness using Probe Data



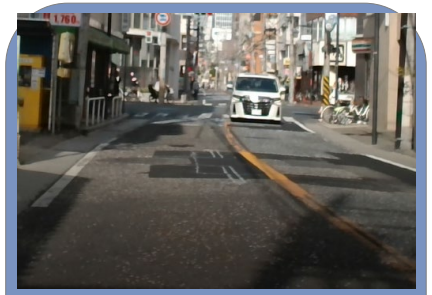
【Ref.】Demonstration Experiment in Japan

Comparative verification between the official survey results (IRI) and our analyzing results (RSM) of road surface condition with local government.

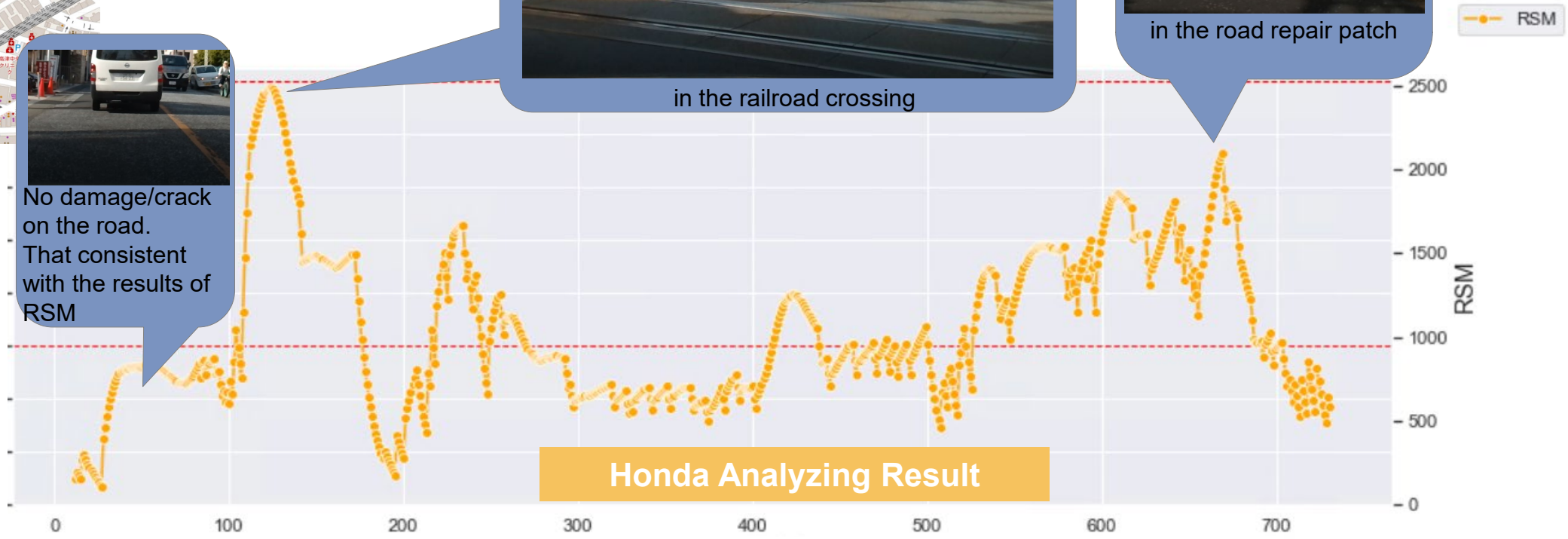
No damage/crack on the road. That consistent with the results of RSM



in the railroad crossing



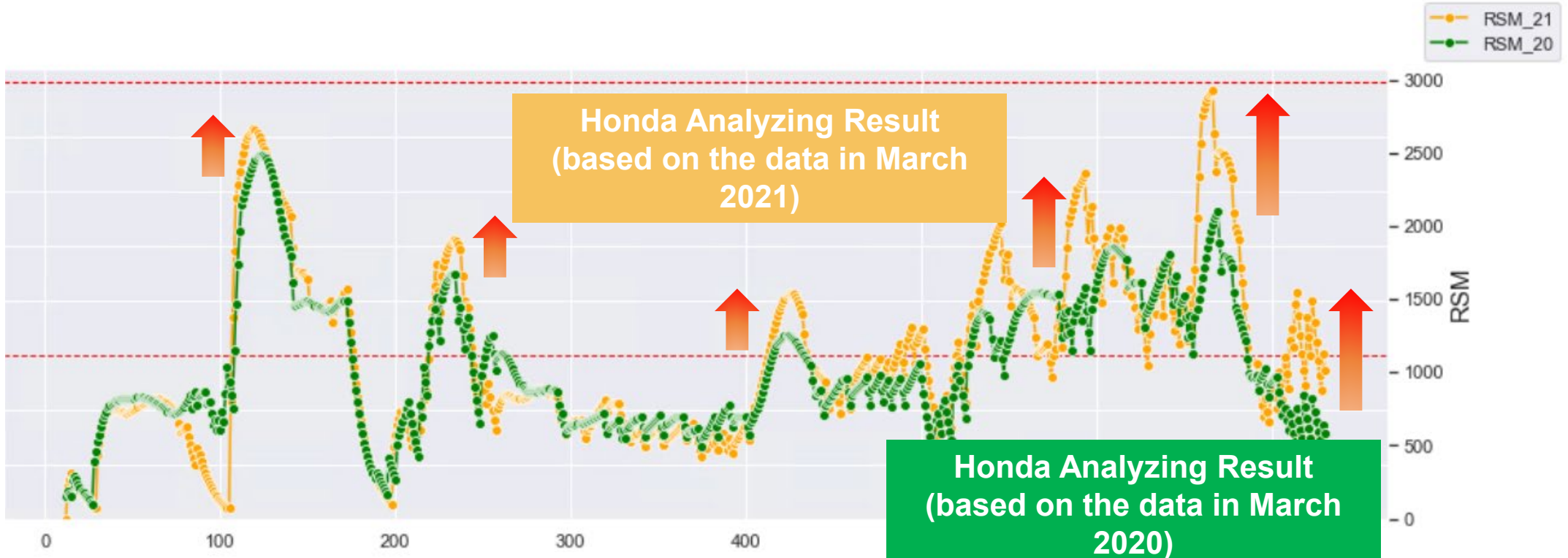
in the road repair patch



The local government officer gives comment

“RSM represents traditional IRI most accurately ever.”

Aging prediction by probe data



Periodic observation enables road surface aging prediction

Summary

- **Honda aims to realize a collision-free society where everyone sharing the road can safely and confidently enjoy the freedom of mobility.**

- **The next level: Empower drivers to be part of building a greater roadway environment together!**

“FOR THE BENEFIT AND ENJOYMENT OF THE PEOPLE”

The more you drive a Honda, the better your community becomes

Let’s work together to build a better and safer roadway together!

Insights and Perspectives from Members of the RODx Industry

Panel Session:

Dean Deeter, Athey Creek Consultants Moderator

Panelists:

- Mike Haas, Arcadis U.S.
- Shane Zumpf, Trihydro
- Steve Voit, Monotch
- Mike Brown, SWRI
- Nikola Ivanov, UMD CATT Lab

Industry Panelists

Shane Zumpf, Trihydro

Steve Voit, Monotch

Mike Brown, SWRI

Nikola Ivanov, UMD CATT Lab

Mike Haas, Arcadis U.S.

ARCADIS

Trihydro

monotch
SMART MOBILITY PLATFORMS

SwRI

CATT LABORATORY

Panel Question #1:

How could various state, local, and industry situational data exchanges interface with one another to enable a national roadway network data layer (federated approach, national Dx, etc.)? What institutional approach could facilitate this integration of situational data exchanges and what might be the most effective federal role?

Mike Haas,
Arcadis U.S.

Shane Zumpf,
Trihydro

Steve Voit,
Monotch

Mike Brown,
SWRI

Nikola Ivanov,
UMD CATT Lab

Panel Question #2:

What type of data or insight can be supported by situational data exchanges at national network scale that the public sector is not yet considering? (e.g., roadway asset condition, EV charging stations, SPaT, etc.)

Shane Zumpf, Trihydro

Steve Voit, Monotch

Mike Brown, SWRI

Nikola Ivanov, UMD CATT Lab

Mike Haas, Arcadis U.S.

ARCADIS

Trihydro

monotch
SMART MOBILITY PLATFORMS

SwRI

CATT LABORATORY

Today's presenters

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Athey Creek CONSULTANTS

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Upcoming events for you

December 11, 2023

TRB Webinar: Understanding Evacuation Behavior and Regional Resilience

December 13, 2023

TRB Webinar: Utilizing External Data Sources for Maintenance Decision Making

https://www.nationalacademies.org/trb/events

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www.trb.org/AnnualMeeting

Annual Meeting Sessions — ACP15

https://annualmeeting.mytrb.org/OnlineProgram/Browse

Sunday, January 7, 2024

Workshop 1003: Transportation Systems Management and Operations Data Exchanges: On-Ramps to the National Roadway Digital Infrastructure

Sunday, January 7, 2024

Workshop 1004: Preparing, Conducting, and Summarizing the Results: Assessing Traffic Management Systems

Sunday, January 7, 2024

Workshop 1042: Information Technology Will Not Let Me Work and Operations Technology Will Sink Our Network

Thursday, January 11, 2024

Workshop 5002: Roadway Digital Infrastructure Strategy

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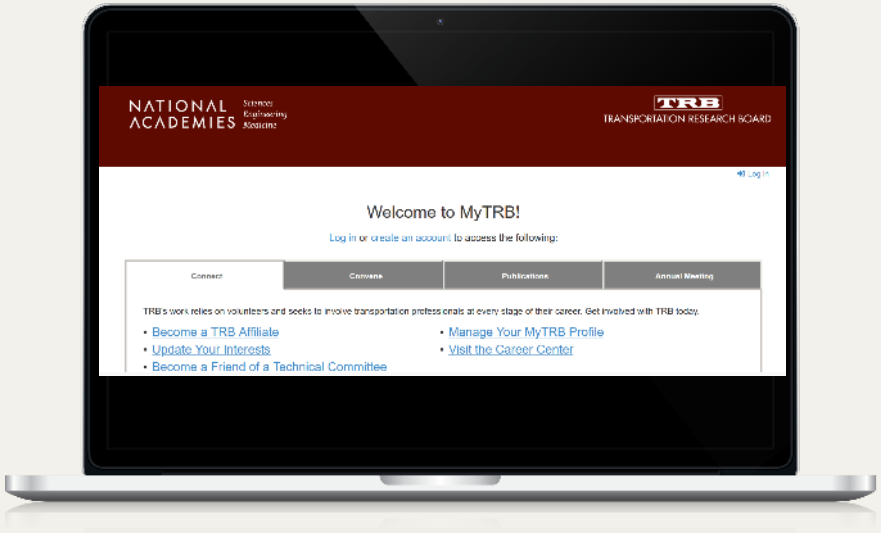

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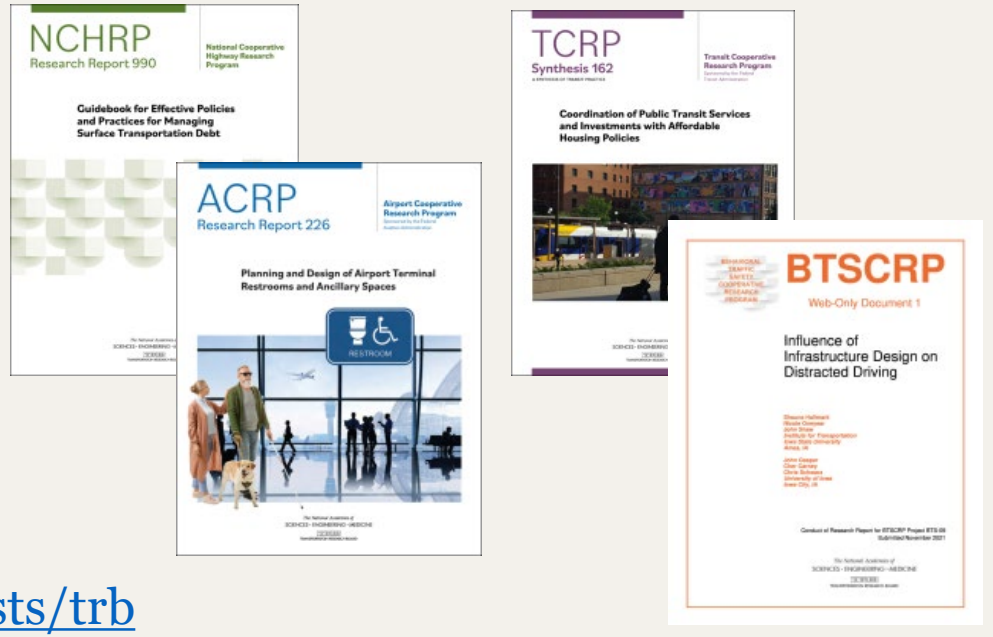

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