

USDOT ITS Research Program

May 1, 2012

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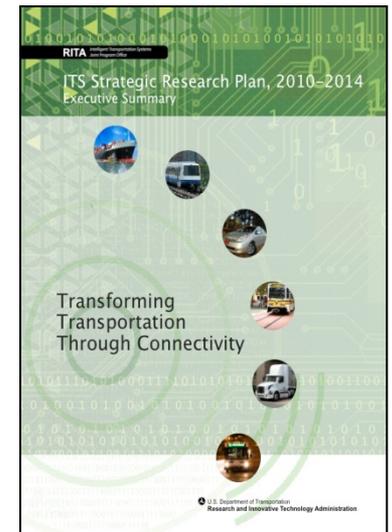
ITS Strategic Research Plan 2010-2014

A Truly Multimodal and Connected Effort

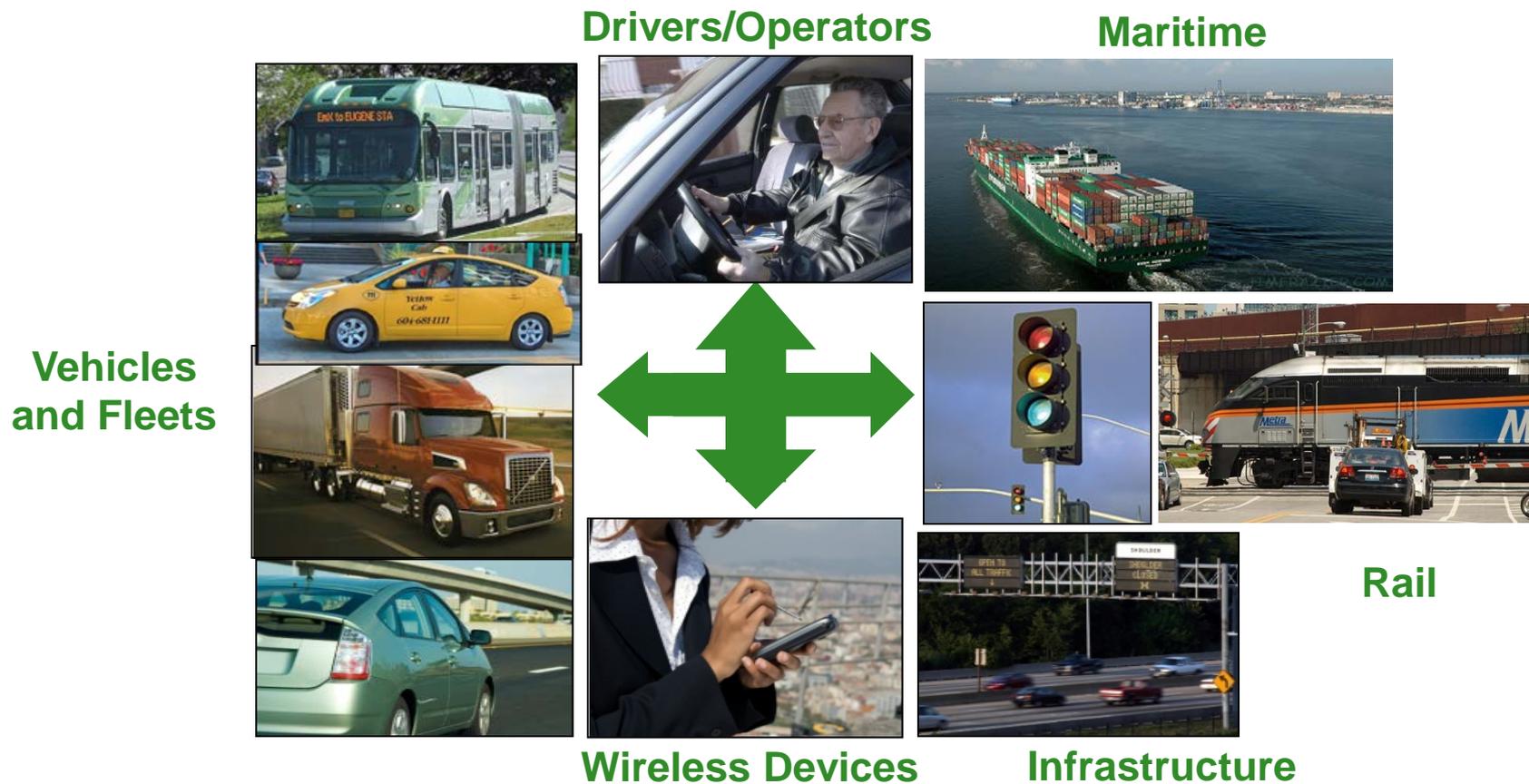
Vision

To research and facilitate a national, **multimodal surface transportation system** that features a connected transportation environment around **vehicles of all types**, the infrastructure, and portable devices to serve the public good by leveraging technology to maximize safety, mobility, and environmental performance.

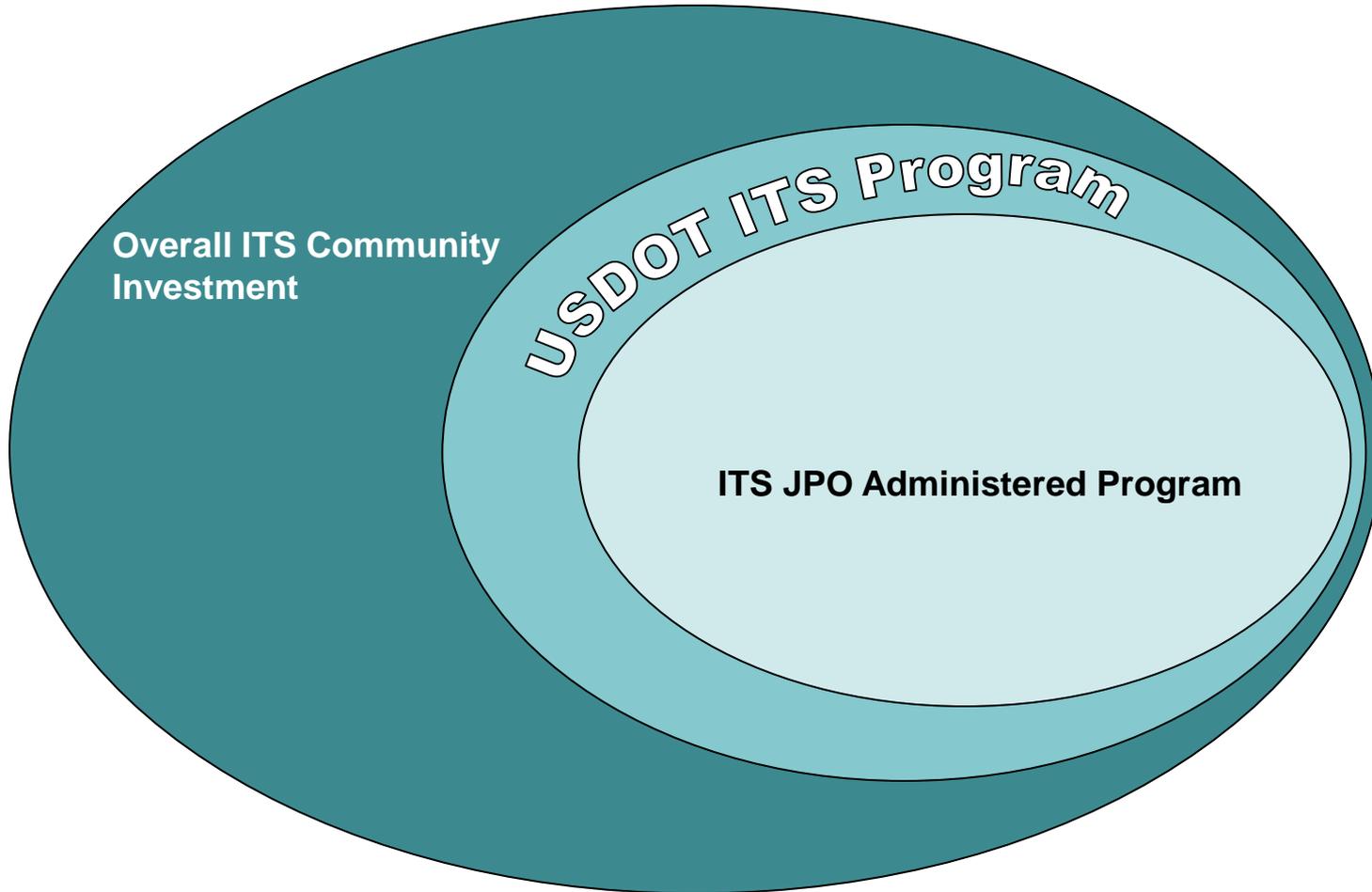
Plan developed with full participation by all surface transportation modal administrations as well as with significant interaction with multi-modal stakeholders.



ITS Research = Multimodal and Connected



ITS Strategic Plan – ITS JPO Administered Program



USDOT ITS Strategic Plan 2010 to 2014 Funding Areas

- ITS Multi-modal Research Applications
- ITS Multi-modal Research Technology
- ITS Multi-modal Research – Policy and Stakeholder Engagement
- Short-term Intermodal ITS Research
- ITS Exploratory Research
- ITS Cross-cutting Support

For More Information

RITA U.S. Department of Transportation
Research and Innovative Technology Administration

Intelligent Transportation Systems
Joint Program Office

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... transit and truck drivers receive regular updates, allowing them to stay on schedule -- and stay in business.

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Our Current Research

Applications Mode-Specific Cross-Cutting

- Vehicle-to-Vehicle Safety
- Vehicle-to-Infrastructure Safety
- Real-Time Data Capture
- Dynamic Mobility Applications
- Environment
- Road Weather

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Fully Connected Vehicle

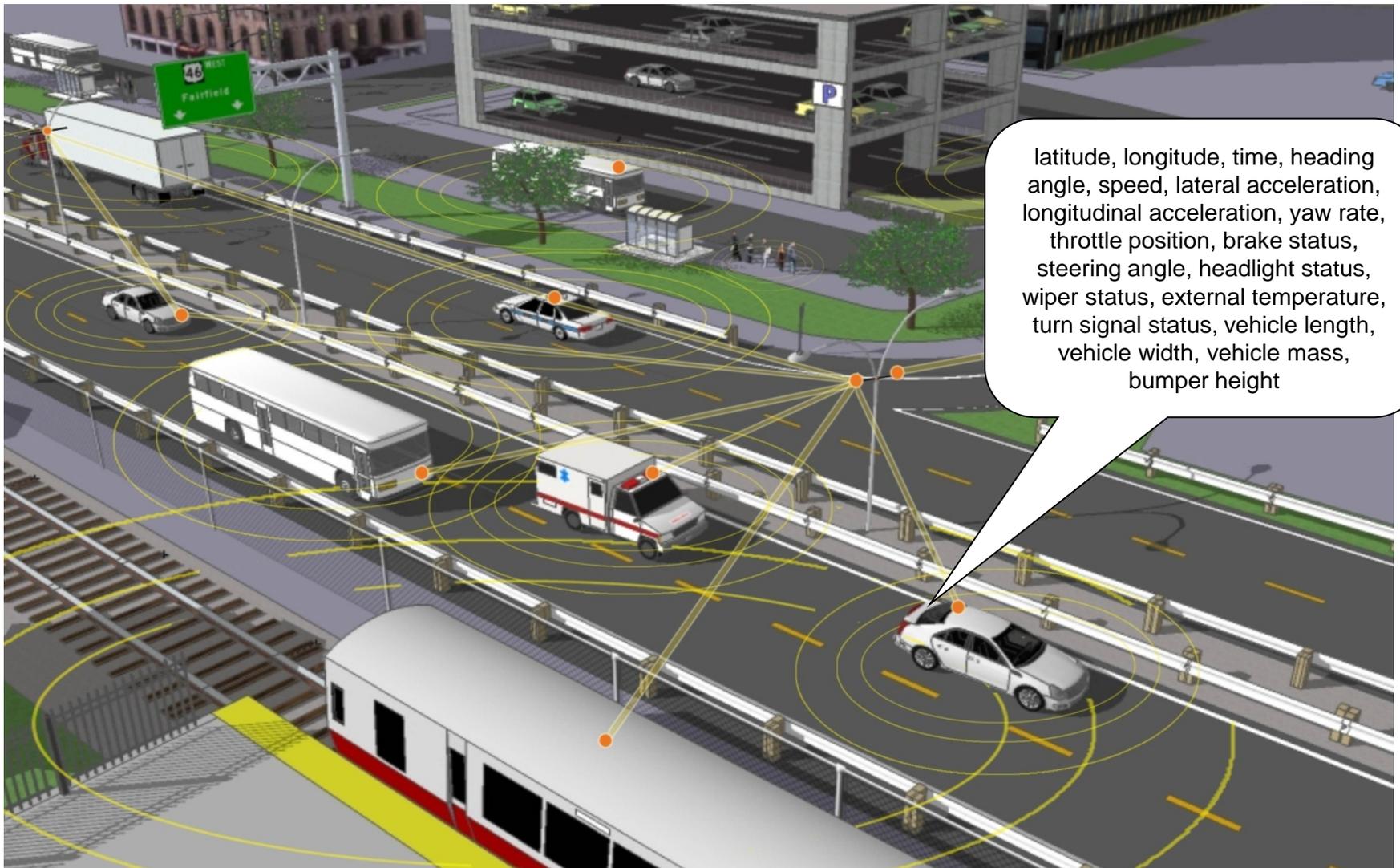
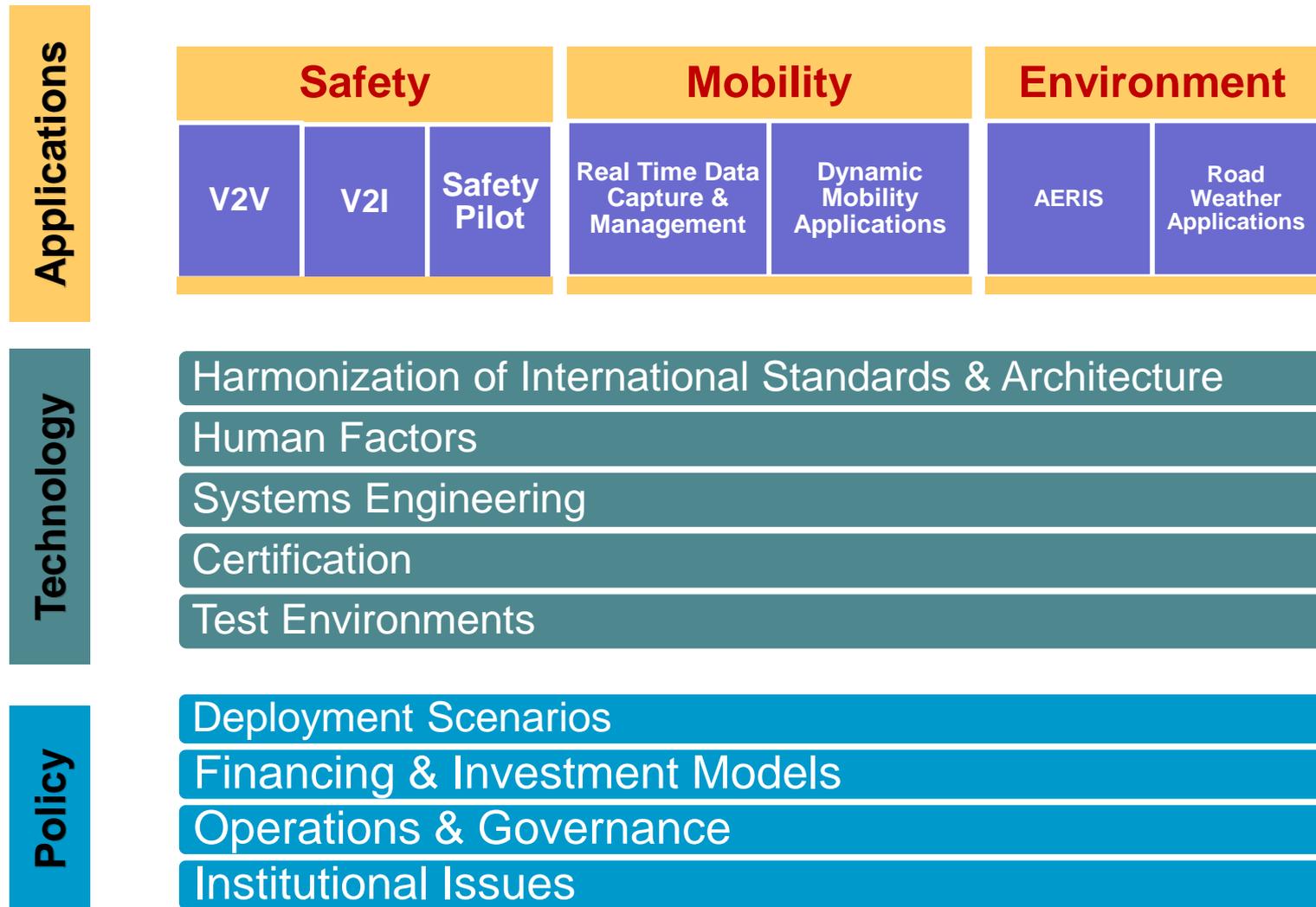


Image: U.S. DOT

Connected Vehicle ITS Research Program Components



Key Updates on Connected Vehicle Research

- Safety Pilot
- Policy
- V2I Safety
- Data Capture and Management
- Dynamic Mobility Applications
- AERIS
- TestBed

Safety Pilot Objectives

- Generate empirical data for supporting 2013 and 2014 decisions
- Show capability of V2V and V2I applications in a real-world operating environment using multiple vehicle types
- Determine driver acceptance of vehicle-based safety warning systems



Safety Pilot Objectives (cont)

- Assess options for accelerating the safety benefits through aftermarket and retrofit safety devices
- Extend the performance testing of the DSRC technology
- Collect lots of data and make it available for industry-wide use
- Let others leverage the live operating environment



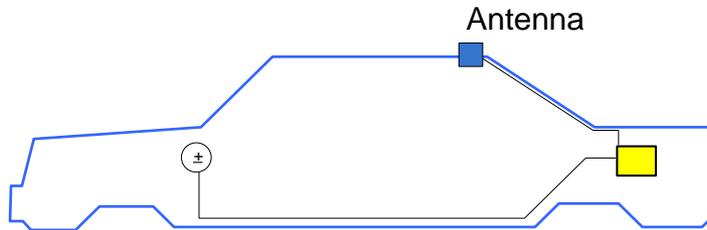


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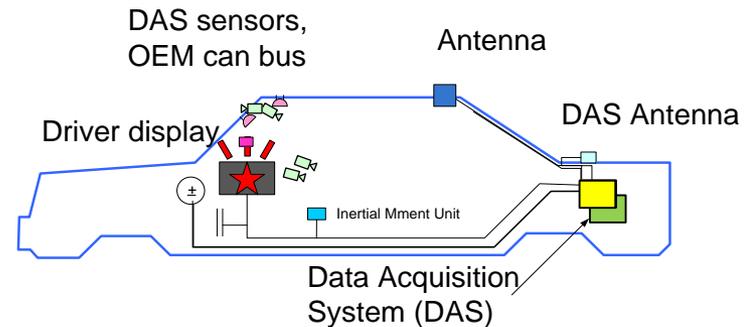
Device Installation Examples

(Passenger vehicles - Drivers' own vehicles)

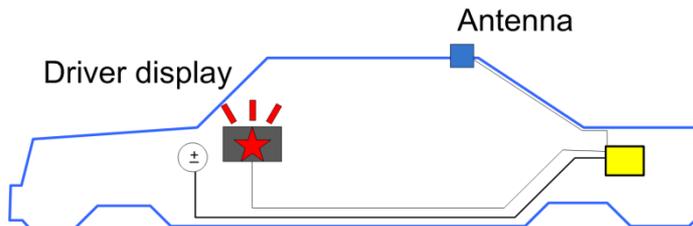
Vehicle Awareness Device



Aftermarket Safety Device with Data Acquisition System (DAS)



Aftermarket Safety Device



Data Acquisition from:
Aftermarket device
Radar or ranging device(s)
4 cameras, microphone
OEM CAN bus data
Vehicle motion
Cell & GPS antennas



Commercial Vehicle Fleets

(3 Integrated Trucks, 16 Retrofits, ~50 VADs)

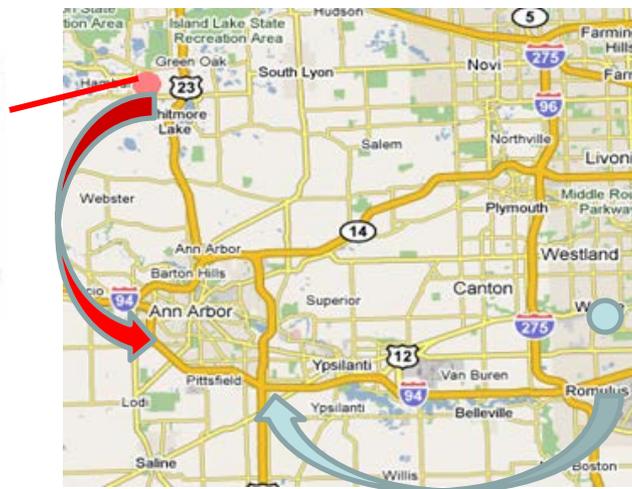
Con-way Freight

- Less-than-truckload carrier (daytime pickup/delivery, nighttime line-haul)
- UMTRI/DOT partner in past projects



Sysco Detroit LLC

- Food-service products for restaurants, schools, etc.
- Mix of tractors, trailers



MODEL DEPLOYMENT

Transit Vehicle Fleets

(3 Integrated Buses, ~100 Vehicle Awareness Devices)

Ann Arbor Transit Authority

- Operates 67 buses
- Active in national programs



University of Michigan

- Operates 61 buses
- Model deployment area spans two separate campuses with high bus traffic between and within.

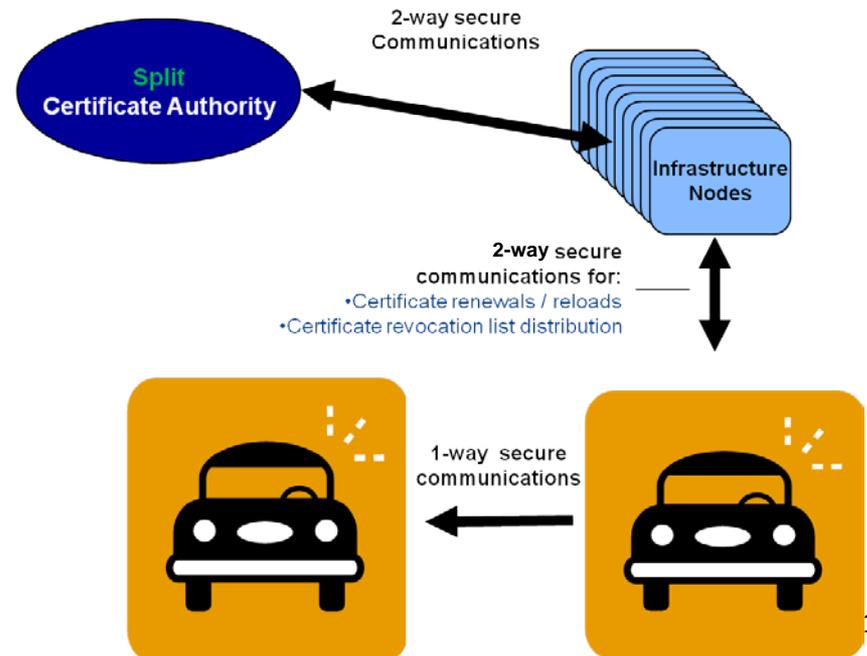
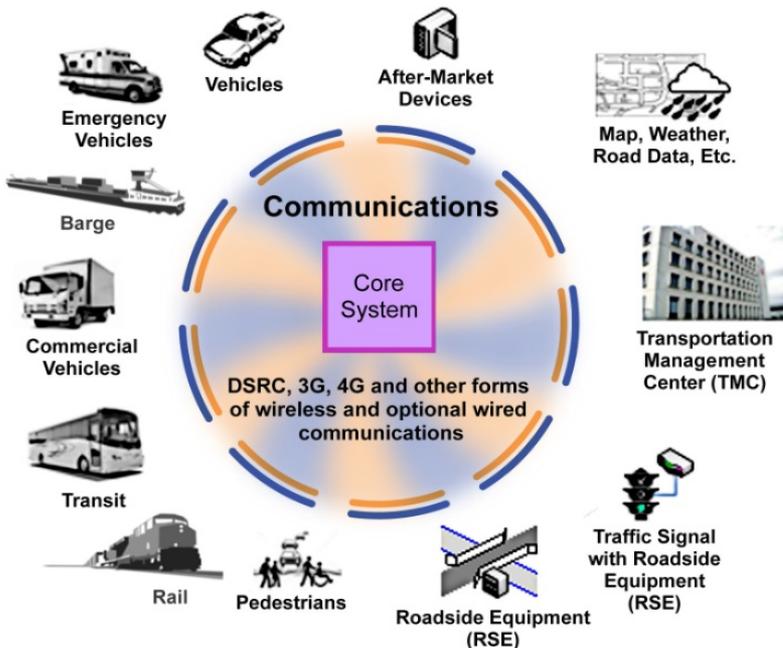


Policy Research Focus

- **Determine if V2V is feasible to implement**
 - **Security Needs**
 - Functional Requirements
 - Physical/Technical Requirements
 - Operational & Organizational Requirements
 - Financial Sustainability and Responsibility

Policy - Security Network

- The V2V/V2I system requires communications media for two critical purposes:
 - Secure communications for distribution of certificates and revocation lists to make sure that entities on the system are legitimate users
 - Trusted communications for delivering safety application data and messages (and, potentially, other applications and services)



Critical Questions

- **Which communications media can support the needs for distributing security certificates? Choices include:**
 - Existing Cellular Networks
 - Dedicated Short Range Communications (DSRC)
 - WiFi
 - Vehicle-Based Security Option
- **What are advantages and limitations of each?**
- **How should the organizational functions of security certificate distribution and management be structured?**
 - Who should be responsible for them and how should they be funded initially and over time?

Communications Network Options and Analysis to Date

Analyze Data Delivery (Network) Options:

Requirements Definition: Fall 2011

Communications Options Analysis: Winter 2011/12

Business Models Analysis: Spring/Summer 2012

Supportable Operationally – Certificate Management

- **Develop Certificate Management Organizational/Operational Models:**
 - Roles and responsibilities
 - Organizational models
- **Project Schedule:**
 - Options delivered in winter 2011
 - Public meeting held in April 2011 (for organizational analysis and network options – interim analysis for both projects)
 - Prototype testing: June 2012
 - Test Results and Evaluation of Approach: Jan 2013
 - Final Report: July 2013

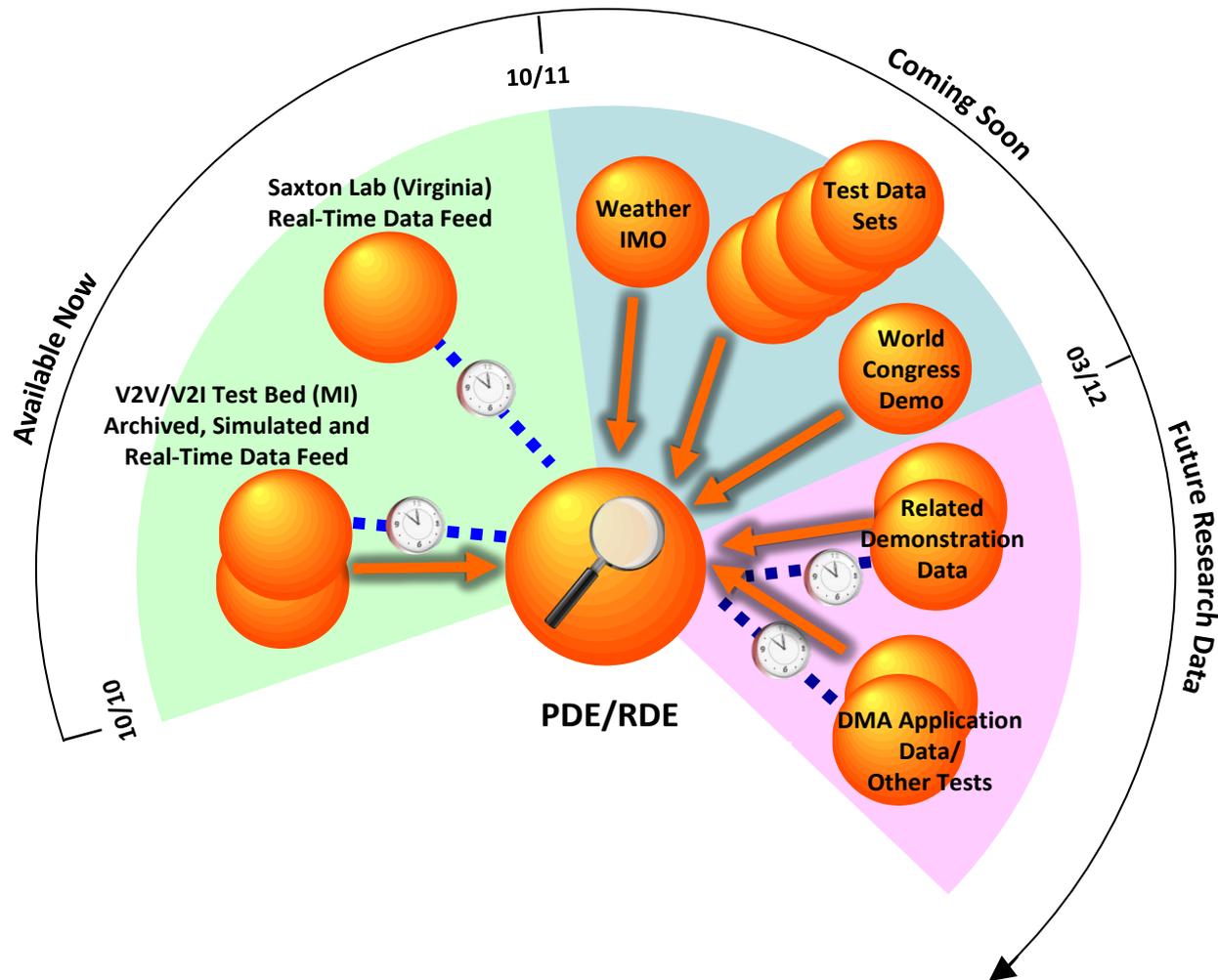
Supportable Operationally – Financial Models

- **All security network options require financing for operational support**
 - **All public** – politically feasible?
 - **Public/private partnership** – what type of framework?
 - **All private** – where's the value?
 - Data
 - Transactions
 - Spectrum
 - Other

V2I Safety

- Enabling Technologies – Working Towards an Integrated V2I Prototype
 - Signal Phase and Timing
 - Positioning
 - Communications
 - Mapping
 - End of 2012
- Applications
 - Broad Concept of Operations with initial apps of Curve Speed Warning, Stop Sign Gap Assist, and Red Light Violation Warning
 - Transit Applications
 - Smart Roadside
 - Working towards launching application development in 2012

Data Capture and Management: Near-term Data Products



Data Capture and Management – Key Issue

- Assessment of Data Elements in the SAE J2735 - Basic Safety Message
 - What can we do with the Data if delivered only via DSRC (Density of roadside locations to be effective)?
 - What can we do if the data is delivered via other communication media?
 - Are there other critical data elements?
- Do we need to modify the SAE J2735 Probe Data Message Process and do we need to develop a performance criteria standard?

Dynamic Mobility Applications

- 6 Mobility Bundles Selected
- Contracts awarded to develop Concepts of Operations
- Stakeholder Workshops to Gather User Needs in progress
 - EnableATIS – held Dec 8, 2011
 - FRATIS – held Nov 3, 17, 29 and Dec 3, 2011
 - INFLO – held February 8, 2012, in Washington DC
 - IDTO – held January 26-27, 2012, in Washington DC
 - R.E.S.C.U.M.E. – TBD
 - M-ISIG – Summer
- Mobility Stakeholder Workshop May 24, 2012 in Washington DC following the ITS America Annual Meeting

AERIS

- Identified Transformative Apps - Eco-Signals, Eco-Lanes, Low Emissions Zones, Support for Alternative Fuel Vehicle operations, Eco-Traveler Information, and Eco-ICM
- Coordinated Nationally and Internationally - Held six webinars (Intro to AERIS, two on State of the Practice Reports, and three on the BAA research results), US/EU Sustainability Working Group (Vienna, Orlando), Japan METI and MLIT
- Developed detailed outlines for each of the transformative Concepts in preparation for development of ConOps for each
- Conducted a public workshop March 14-15 in Washington, DC to further discuss data and other requirements for the TCs

Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) Technology Test Bed and Affiliated Interoperable Test Beds



UNITED STATES
DEPARTMENT OF TRANSPORTATION

Near Term Connected Vehicles What Could I Do

- Review the Recently Released Connected Vehicle System Architecture
- USDOT is Establishing Research Stage Qualified Products Lists for Interoperable: Vehicle Awareness Devices, Aftermarket Safety Devices, and Roadside Equipment
 - Consider Buying Some, Get Engaged, Do Some Research
 - USDOT to post Mobility Research Questions soon
 - Considering additional Challenges using equipment and data
- Stakeholder Input Sessions Attend, Contribute, Lead
 - Safety - September 25 to 27, 2012, Chicago, Illinois
 - Dynamic Mobility Applications - May 24, 2012, Washington, DC
 - AERIS – held in March
 - Policy – held in April
- Updated Connected Vehicle Testbed coming soon

Other Currently Funded Research Programs

- Integrated Corridor Management
- Mobility Services for All Americans
- Congestion Initiative
- Rural Safety Initiative
- Active Traffic and Demand Management
- CVISN
- International Border Crossings
- Technology Options for Collecting Transportation User Fees
- Heavy Rail Communications Assessment
- Cybersecurity Assessment
- Vehicle Automation Assessment
- Electric Vehicles and the Connected Vehicle Assessment

Longer Term Research Gaps

- Automated Vehicles –
 - What “level of automation” is appropriate?
 - How do we leverage connected vehicles?
 - Liability, policy, State of Technology, Deployment Schemes
 - TRB ITS Committee and Automated Highway Systems Committee summer meeting July 25 to 27
- AERIS / Electric Vehicles
 - How to leverage the Smart Grid and the connected vehicle system?
 - What data is shared?
 - What is the relationship between Connected Vehicles, the Smart Grid and the Cloud?
 - Are there modeling techniques which merge the power demands of an electric vehicle fleet and the power generation capacity and management of the SmartGrid
- Decision Support Systems – Using the Data for Operations Management
- How to data mine crowd sourced data from apps like Waze and bring them into a TMC environment
- Economic analysis of the value of privacy with respect to travel. Analysis could begin on Pay As You Drive (PAYD).

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