

## **SS 5:3 COOPERATIVE SYSTEMS**

# Connectivity Enabling Safer, More Efficient and Sustainable Multi-modal Transportation

Robert L. Bertini, Ph.D., P.E., Deputy Administrator  
Acting Director, Intelligent Transportation Systems Joint Program Office  
Research and Innovative Technology Administration  
U.S. Department of Transportation

# Secretary LaHood's Priorities

- **Safety:** Improve public health and safety by reducing transportation-related fatalities and injuries.
- **State of Good Repair:** Ensure the U.S. proactively maintains its critical transportation infrastructure in a state of good repair.
- **Economic Competitiveness:** Promote transportation policies and investments that bring lasting and equitable economic benefits to the nation and its citizens
- **Livable Communities:** Foster livable communities through place-based policies and investments that increase transportation choices and access to transportation services
- **Environmental Sustainability:** Advance environmentally sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources



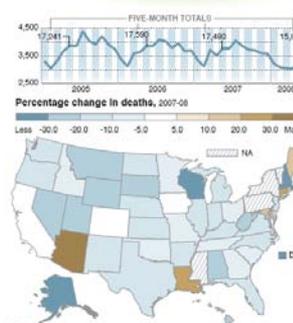
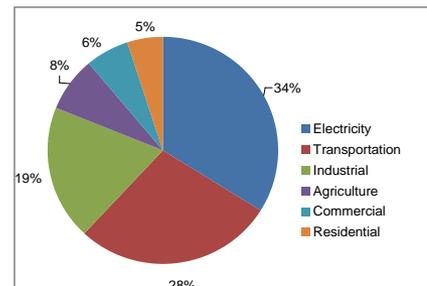
# DOT and the ITS Program: Breaking Down Silos

- More cross modal
- Now including rail and maritime
- Cars, trucks, buses, fleets, and vehicles of all kinds
- Commitment to dedicated short range communications
  - Safety
  - Mobility
  - Environment
- Increased outreach and involvement of stakeholders
- Broadening of participation of public and private sectors and universities

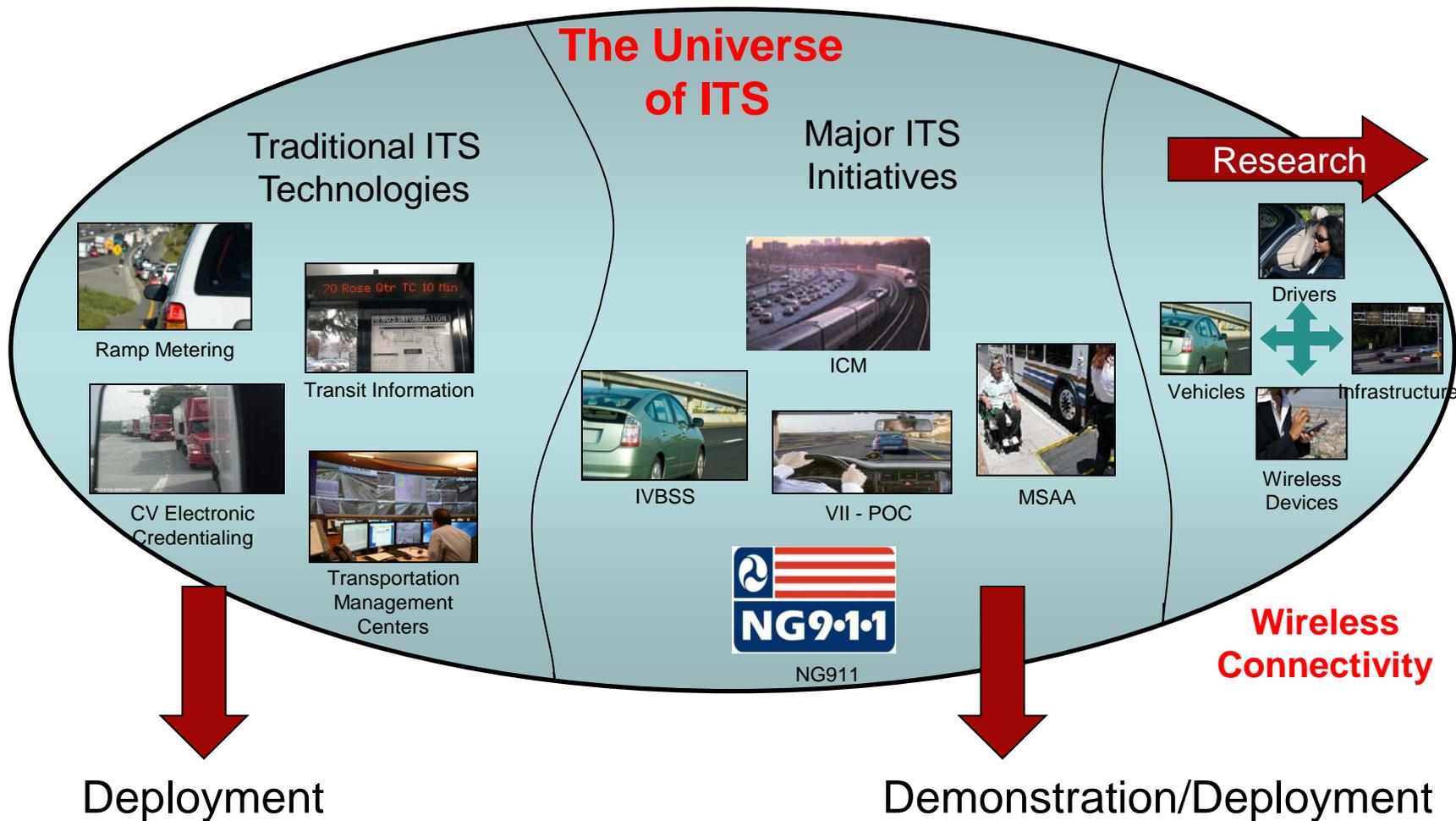


# ITS Strategic Plan – Noteworthy Trends in Transportation

- Stagnant safety statistics
- Growing congestion
- Growing interest in transit
- Growing environmental awareness
- Emphasis on performance measurement & management
- Troubled transportation financing
- Road pricing and financing alternatives
- Transportation impacts lives



# ITS Strategic Plan – Past, Present and Future



# ITS Strategic Plan: Vision for 2010-2014



National, multi-modal surface transportation system that features a connected transportation environment among vehicles (cars, trucks, buses, fleets of all kinds), the infrastructure, and mobile devices to serve the public good by leveraging technology to maximize safety, mobility and environmental performance. Connectivity is achieved through dedicated short range communications (DSRC).

## Goal: Safety

Vehicle to Vehicle Communications for Safety  
Vehicle to Infrastructure Communications for Safety

## Goal: Mobility

Real-Time Data Capture and Management  
Dynamic Mobility Applications



AERIS

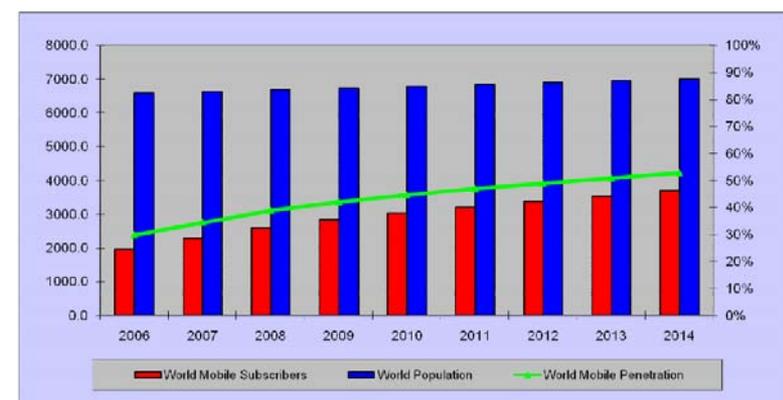
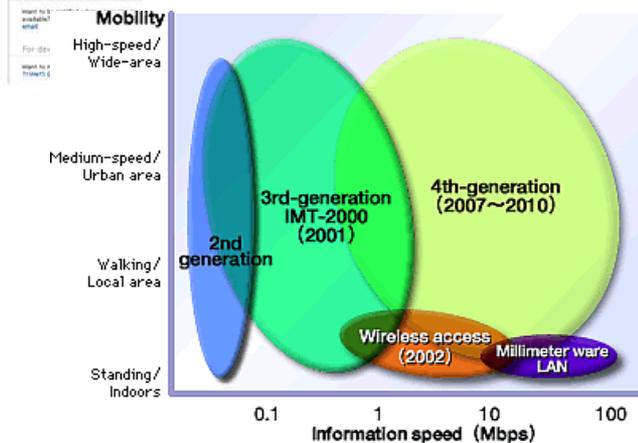
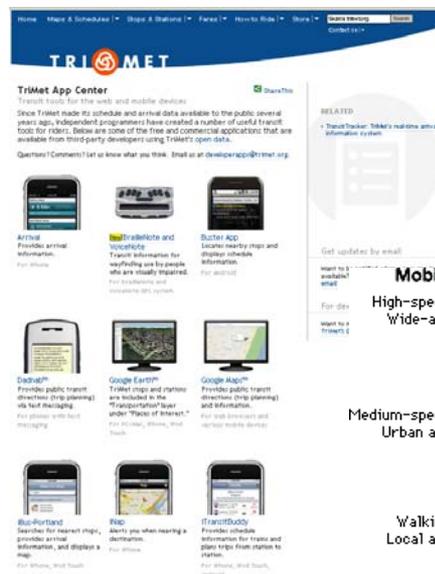
## Goal: Environment

### Applications for the Environment: Real-Time Information Synthesis (AERIS)

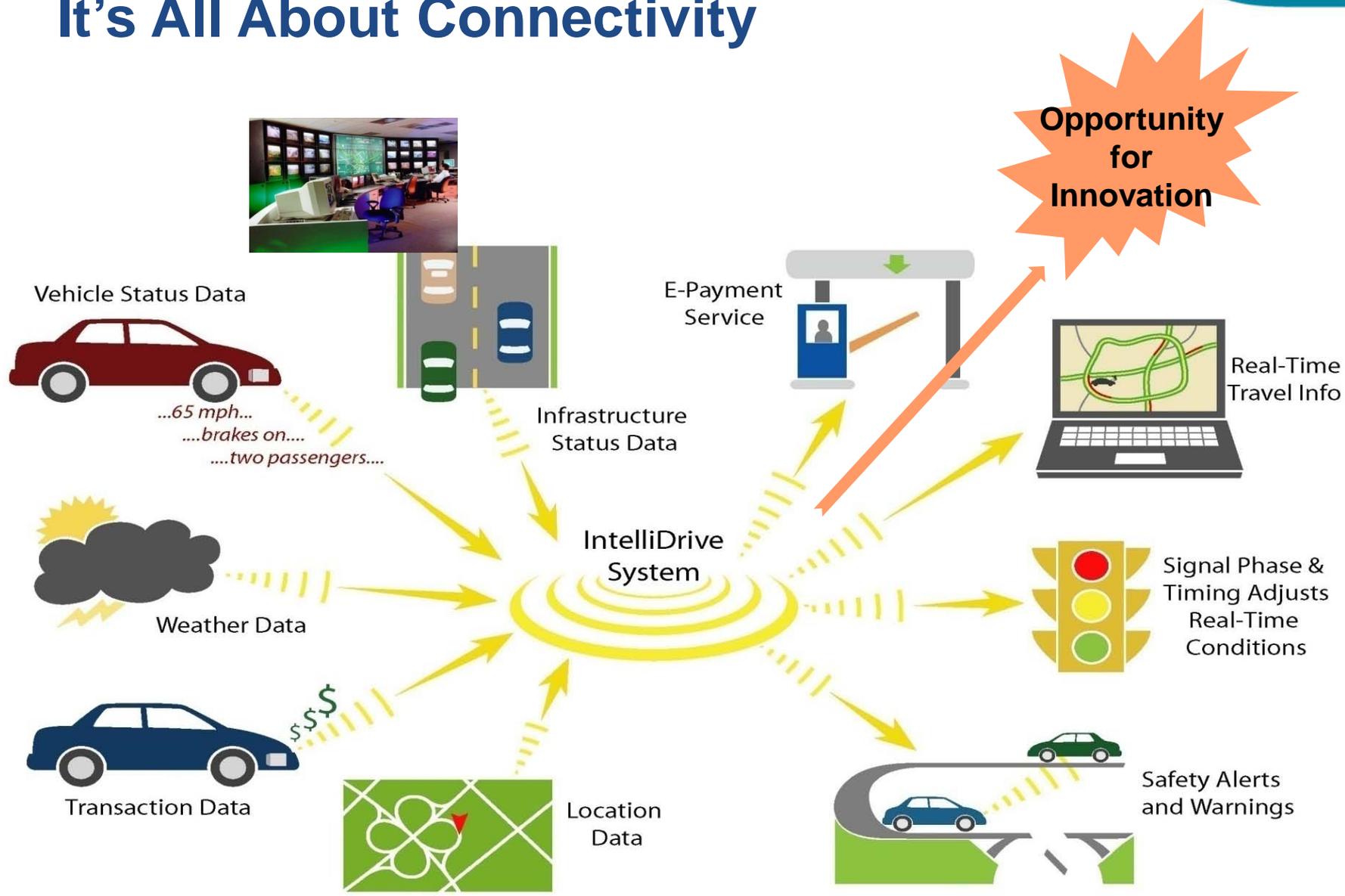
Real-time, environmental data from all sources will be integrated and available for use in multimodal transportation management and performance improvement and will contribute to better environmental practices.

# Technology Trends

- Wireless technology boom
- Proliferation of personal devices
- Expanded wireless networks
- Location based applications
- Open data frameworks encouraging innovation and “apps”
- Strong consumer market
- Fast pace of innovation
- Expectation for information
- Ubiquitous connectivity
- Person-to-person networking



# It's All About Connectivity



# What Can IntelliDrive Do?

## Livability & Mobility Benefits

- Data-Rich Environment
  - Performance Management
  - Operations Efficiency
    - Traffic, Transit, Parking
    - Weather
- *V2I, I2V Interactivity (SPAT)*

## Environmental Benefits

- *Reduce Emissions*
- *Save Fuel*



## Safety Benefits

- **IntelliDrive** could potentially address 82% of the vehicle crash scenarios involving unimpaired drivers
- **Reduce or eliminate crashes** through:
  - **Driver Advisories**
  - **Driver Warnings** and
  - **Vehicle Control**



# The Problem—U.S. and Global

## Safety

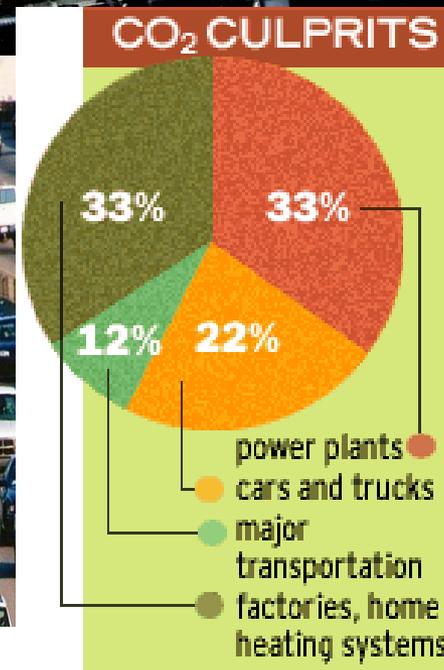
- 33,963 fatalities/year (2009)
- 2.35 million injuries/year (2008)
- 5,800,000 crashes/year (2008)
- **Leading cause of death for ages 4 to 34**

## Mobility

- 4.2 billion hours of travel delay
- \$78 billion cost of urban congestion

## Environment

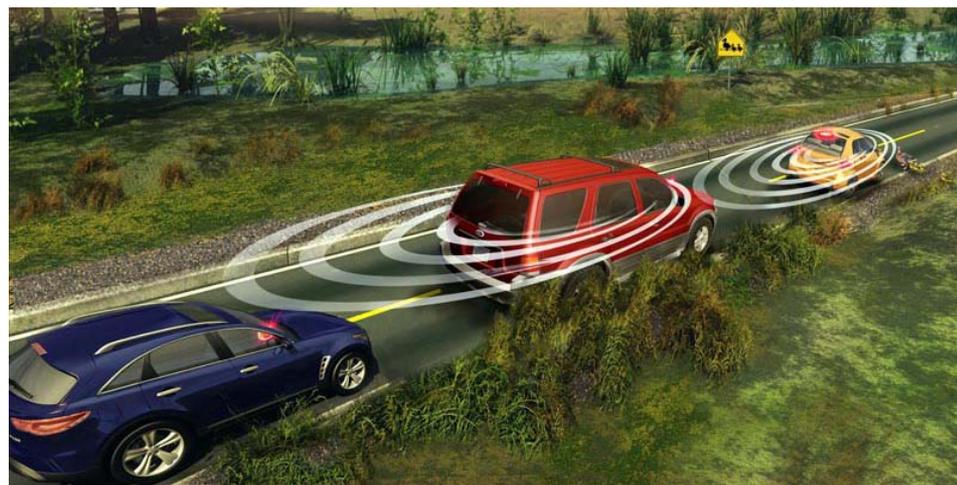
- 2.9 billion gallons of wasted fuel



# Opportunity for Safer Driving

- **Greater situational awareness**
  - Your vehicle can “see” nearby vehicles and knows roadway conditions you can’t see
- **Reduce or even eliminate crashes thru:**
  - Driver Advisories
  - Driver Warnings
  - Vehicle Control

*IntelliDrive has the potential to address 82% of the vehicle crash scenarios involving unimpaired drivers*



# Safety Pilot Goals: 2010–2013

*Support the 2013 Regulatory V2V Decision with Field Data  
Public Awareness & Acceptance*

## Primary Objectives

- Demonstrate V2V real world implementation
  - Multiple vehicle types (cars, trucks, buses, rail, etc)
  - Obtain substantial empirical data
- Assess driver acceptance of vehicle based safety systems
- Explore opportunities for accelerating safety benefits through aftermarket devices and retrofit systems

## Secondary Objectives

- Enable vehicle-infrastructure (V2I) safety applications
- Leverage data for non-safety applications such as mobility, environment, and weather

VSC-A ALPHA REL V1.8

Detailed View Remote Vehicle ID 1

Part 1 CSM	Heading (deg)	181.098533	ABS Status	2	
DSRC Message ID	47190	XAccel (m/s <sup>2</sup> )	0.03	Steering Angle (deg)	205.50
Milliseconds in Minute	00:01:30:22:91	YAccel (m/s <sup>2</sup> )	0.16	Throttle Pos (%)	0.00
Temporary ID	42.506992	ZAccel (m/s <sup>2</sup> )	-10.08	Ext. Lights	0
Latitude (dd)	-83.437873	Yaw Rate (deg/s)	0.00	Vehicle Width (cm)	194
Longitude (dd)	242.50	Brake Status	F	Vehicle Length (cm)	498
Elevation (m)	0.00	TC Status	2		
Vehicle Speed (m/s)					
Part II					
Event Flags	0	PP CenterLat (dd)	41.025043	PP StopLat (dd)	0.000000
Sequence Number	8586	PP CenterLong (dd)	-185.639140	PP StopLong (dd)	0.000000
		PP Radius (m)	838867.00	PP Confidence	99.50

Latitude (dd)	Longitude (dd)	Elevation (m)	Milliseconds	PosError
1	-0.000147	0.000023	-4.58	14500
2	-0.000117	0.000068	0.00	15700

DWVViewer	WMH	SDH	TC	HVPP	PH	Security	EWS
BSW/LCW	CLW	DNFW	EEBL	FCW	MA	SysConfig	ScreenShot



# Safety Pilot Activities: 2010–2013

## Driver Clinics

- Driver acceptance data from light vehicle driver clinics at various locations
  - Explore similar opportunities for other vehicle types
- Performance testing in multiple geographic environments using small numbers of light vehicles and nomadic devices at same locations



## Model Deployment

- Critical Mass/Exposure testing → large number of vehicles and devices creating a “highly saturated” operating environment
- Mixture of integrated safety systems with nomadic devices
- Cars, trucks, buses, fleets, rail crossings
- Lots of vehicles, limited infrastructure

# Safety Applications: The Game Changers

## Research Questions

### Which comes first – vehicles or infrastructure?

- For V2V applications, NHTSA will assess *regulatory* potential
- Outcome of regulatory assessment may indicate that vehicle installation comes first

### How do we get fleet penetration for earlier benefit?

- *Aftermarket* DSRC devices (devices with GPS, cell communication, & power) may offer opportunities
  - “Here I Am” messages
  - Different functionality, and easier to deploy
  - Market potential for aftermarket DSRC devices is not clear

### How do we deploy infrastructure?

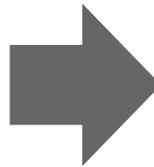
- V2V *may not require DSRC wireless connectivity to roadway infrastructure*; Other wireless communication may be sufficient
- Infrastructure may become a spot safety application
  - Signals, curves, other sites
- DSRC data can be integrated into mobility applications



# Livability and Mobility Benefits

## Mobility Problem

- 4.2 billion lost hours of travel delay
- \$87 billion annual drain on U.S. economy
- 2.8 billion gallons of wasted fuel



## Mobility Benefits

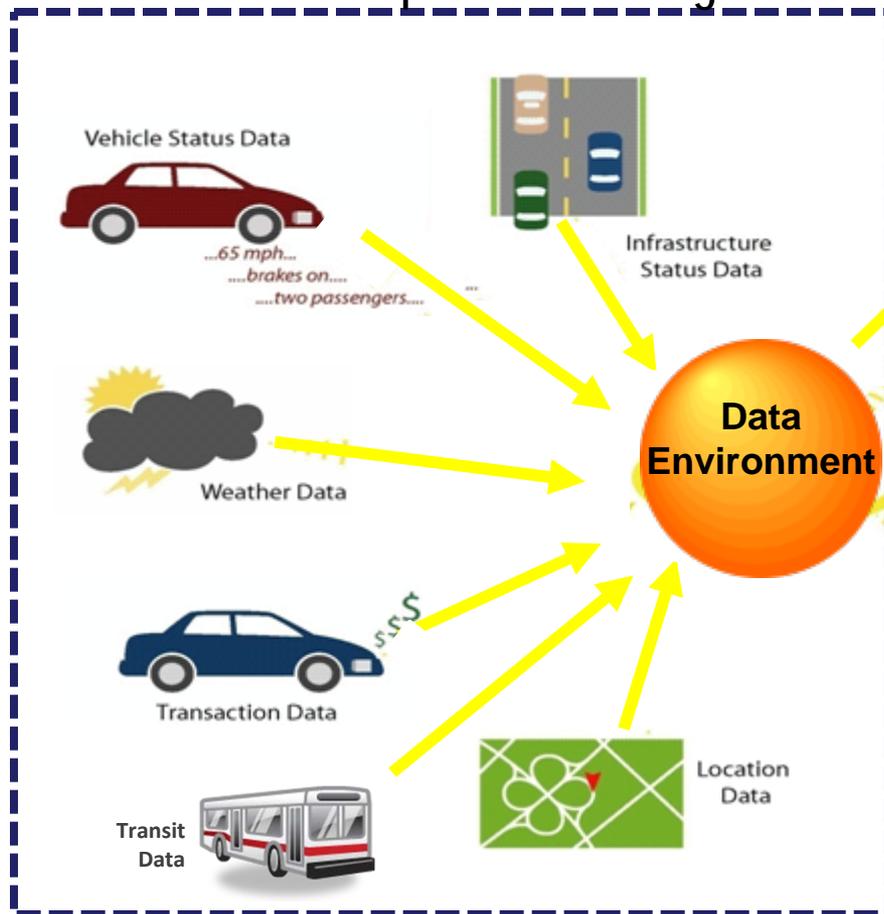
Information-rich environment benefits users and operators of all travel modes:

- **Travelers** have real-time information on rerouting or “modal shift” options
- **System operators** have real-time data to enable better system operations for optimal performance
- **Planners** can use data to improve major investment plans



# IntelliDrive Mobility and Livability

## Real-time Data Capture and Management



## Mobility and Environmental Applications



# Real-Time Data Capture and Management

## Vision

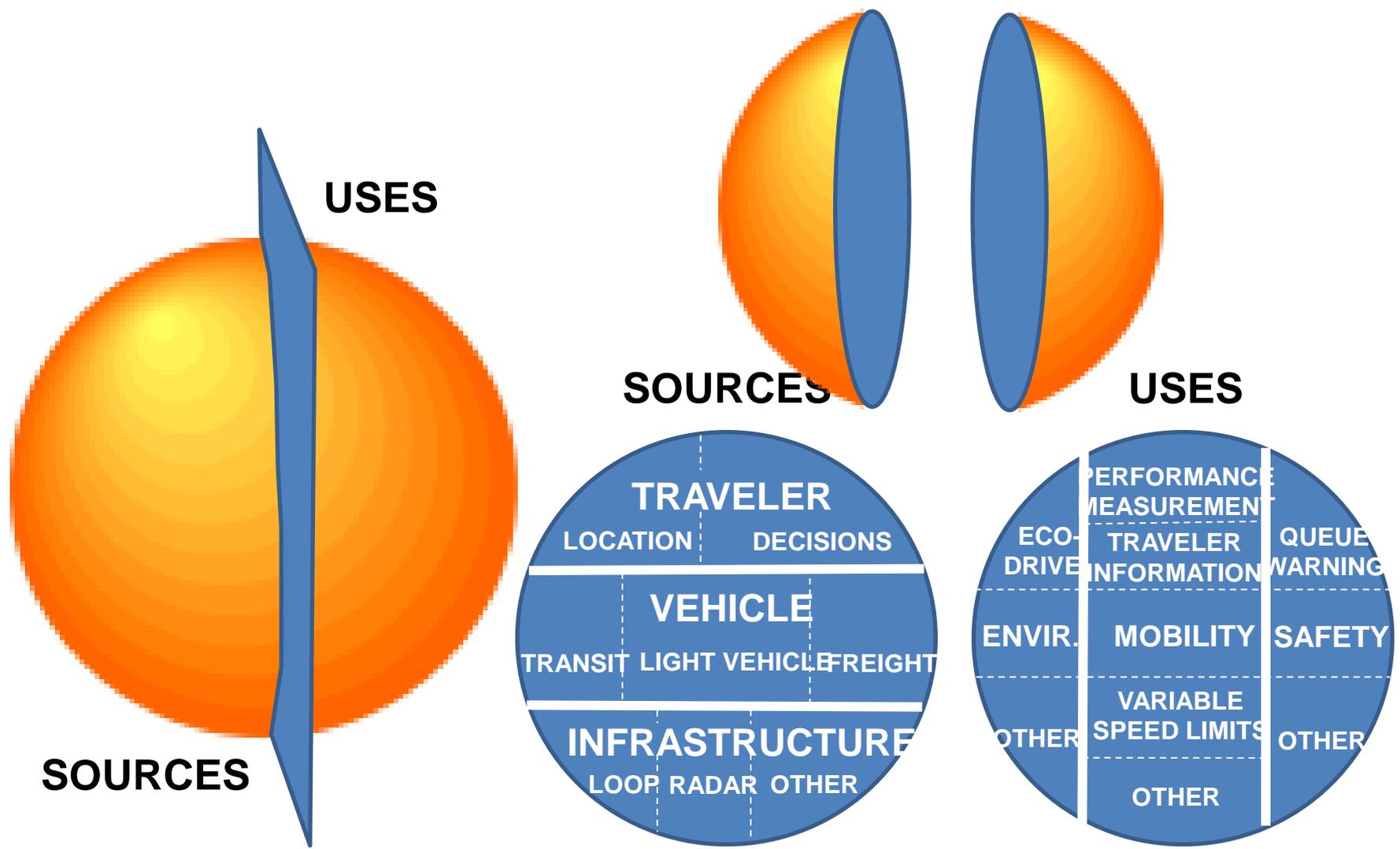
Active acquisition and systematic provision of integrated, multi-source data to enhance current operational practices and transform future surface transportation systems management

## Objectives

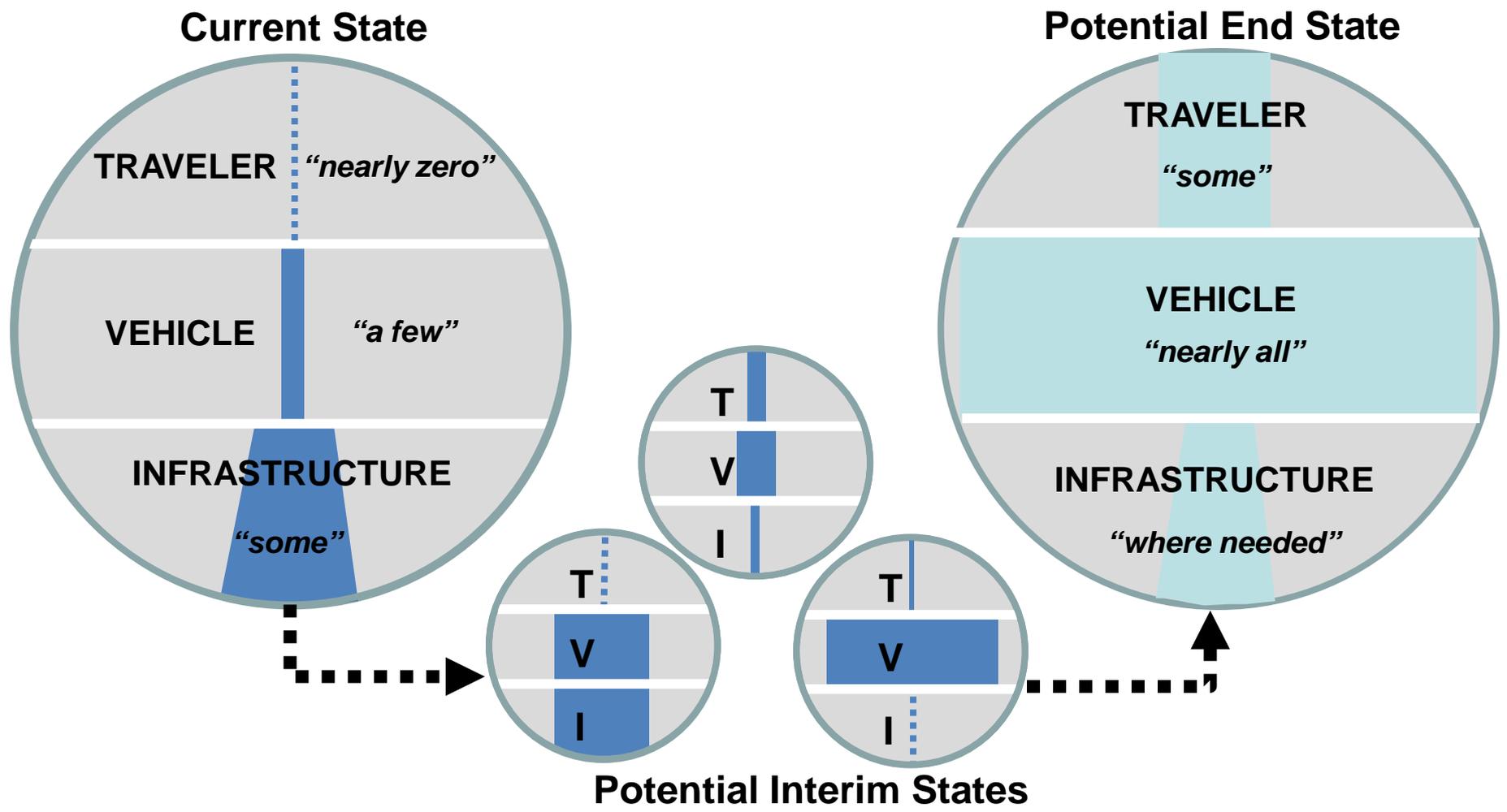
- Enable systematic data capture from connected vehicles (automobiles, transit, trucks), mobile devices, and infrastructure
- Develop data environments that enable integration of data from multiple sources for use in transportation management and performance measurement
- Reduce costs of data management and eliminate technical and institutional barriers to the capture, management, and sharing of data



# Data Sources and Uses



# Data Environment Evolution



# Sustainability @ DOT



*Sustainable development: Meets the needs of the present without compromising the ability of future generations to meet their own needs. (WCED 1987)*



*Sustainability must be a principle reflected in all our infrastructure investments, from highways and transit to aviation and ports.*

Secretary Ray LaHood  
Before the Committee on Commerce, Science and Transportation  
U.S. Senate, January 21, 2009

*Environmental Sustainability: Advancing environmentally-sustainable policies and investments that reduce carbon and other harmful emissions from transportation sources.*

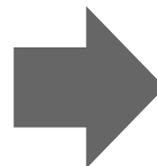
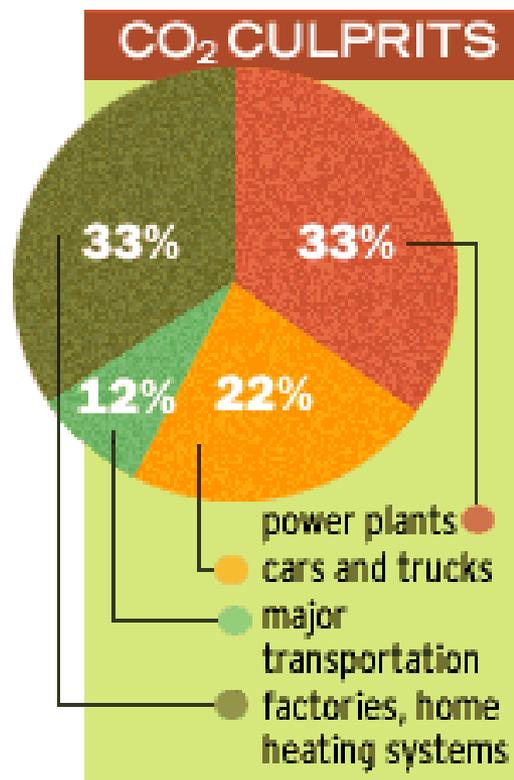
*Sustainable community: If you don't want an automobile, you don't have to have one.*

# Environmental Benefits with Intellidrive

## Environmental Problem

2.9 billion gallons of wasted fuel each year

22% CO<sub>2</sub> emissions from vehicles



## Environmental Benefits

↓ Emissions

↓ Greenhouse Gases

↓ Particulates:

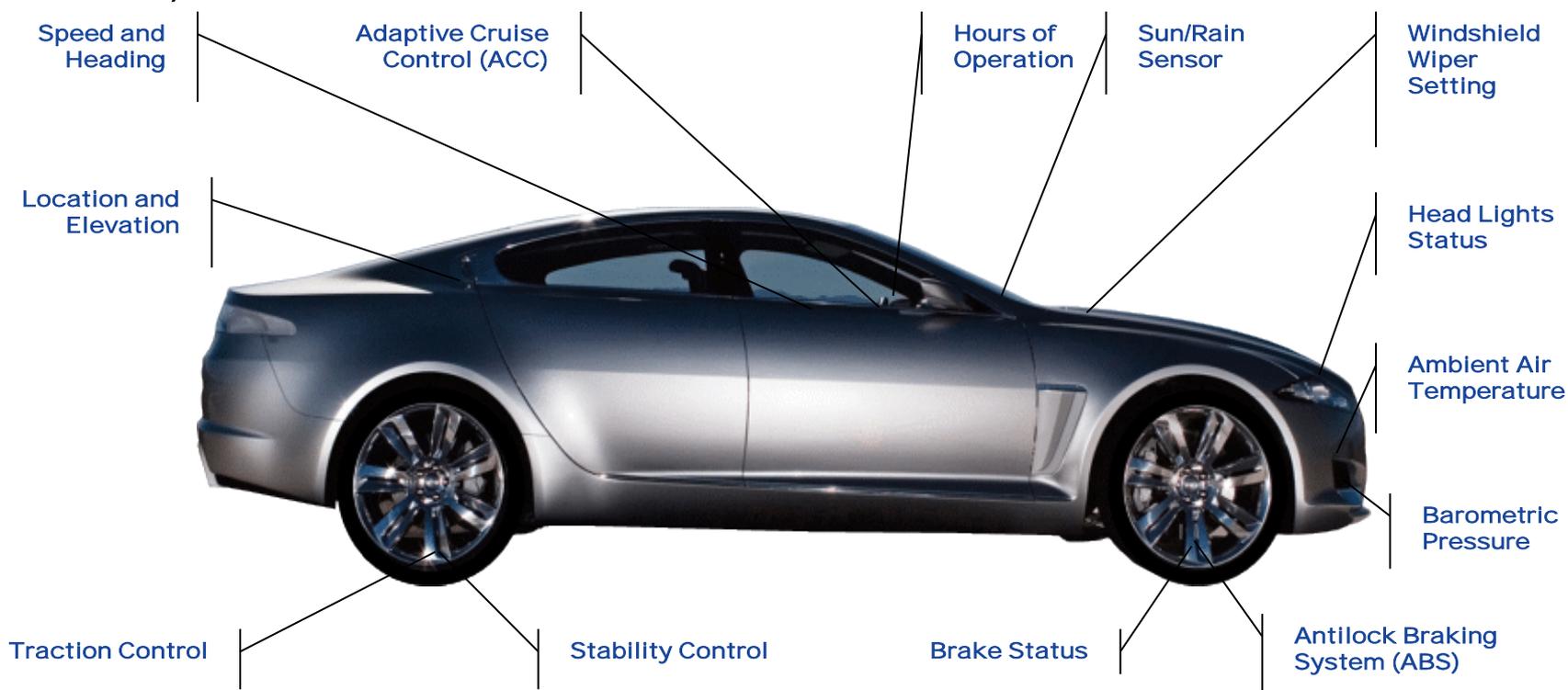
- **Reduced stopping/starting** at traffic signals which consumes 3-5 times more fuel than constant driving
- Navigation systems with real time information can **reduce fuel consumption by 10.5%** over systems without real time traffic data



# Environmental Benefits

## *Imagine*

**Managing** your system for environmental and weather events if you knew specific information about the road & vehicles (cars, trucks, transit)



# AERIS: Research Goal and Objective

## Ultimate Goal

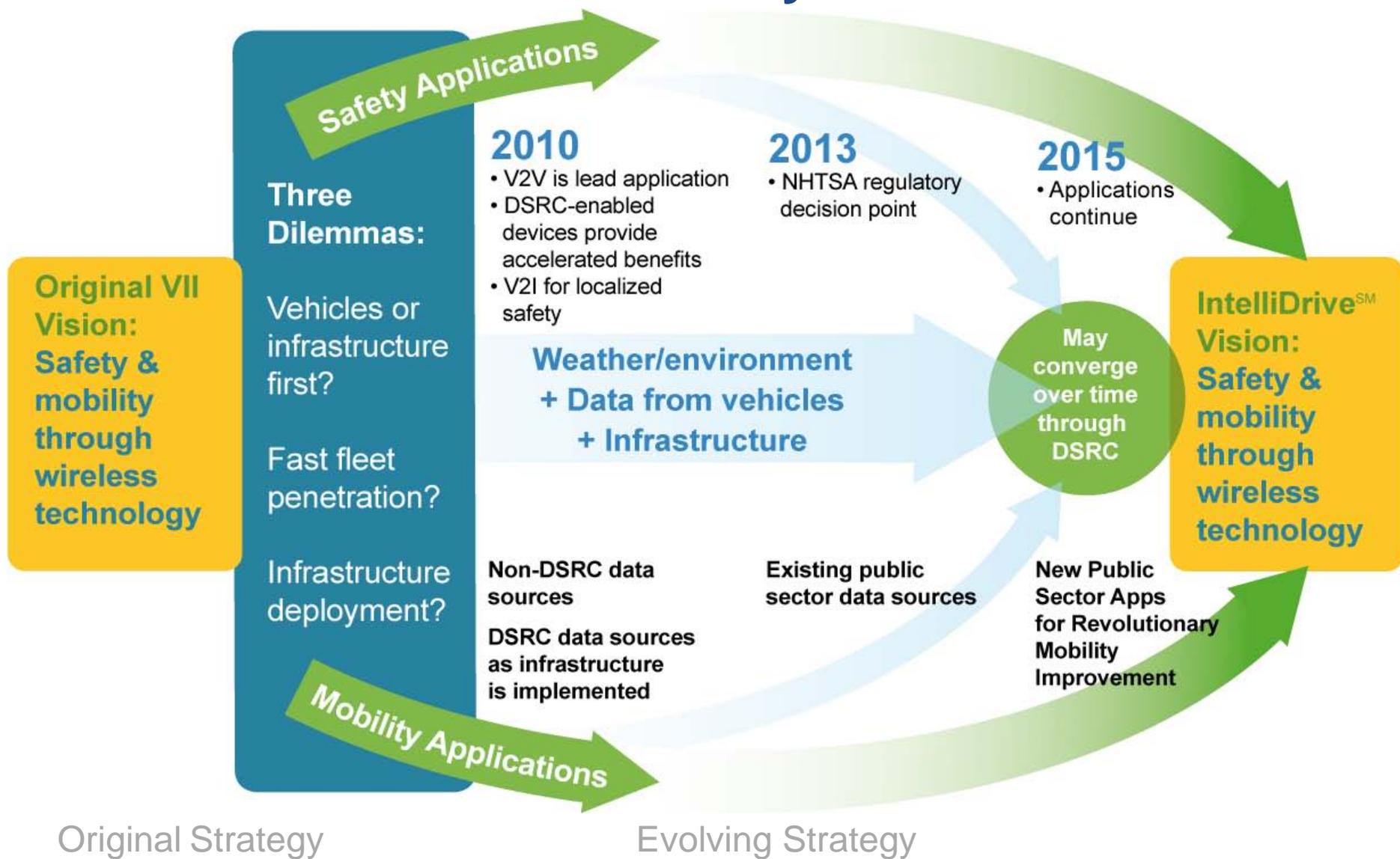
- **Transform** environmental management of the transportation system.

## Objectives

- To investigate whether it is **possible and feasible** to generate/capture **environmentally-relevant real-time transportation data** (from vehicles and the system), and use this data to create **actionable information** that can then be used by system **users and operators** to support and facilitate “**green**” **transportation choices**.
- **Assess** whether doing these things yields a good enough environmental benefit to **justify further investment**.



# Same Vision – New Pathways



# For More Information...

# www.intellicdrive.org

Site sponsored by the US Department of Transportation  
[Research and Innovative Technology Administration](#)

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### News & Updates

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**Proof of Concept Test Results Released**  
 March 11th, 2009 at 4:04pm

**IntelliDrive<sup>SM</sup> Brand Replaces VII**  
 February 23rd, 2009 at 10:12am

**SAFETRIP-21 News**  
 December 4th, 2008 at 3:12pm

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**About IntelliDrive**

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DOT's IntelliDrive Program  
Coalition

**Benefits**

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Consumers

**Research**

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DOT-Sponsored Research  
Activities  
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# Thank You For Your Attention



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[robert.bertini@dot.gov](mailto:robert.bertini@dot.gov)

RITA: [www.rita.dot.gov](http://www.rita.dot.gov)

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