



22nd ITS World Congress

Towards Intelligent Mobility – Better Use of Space

ES05: Getting the Pay-off from Connectivity

October 7, 2015

Kenneth Leonard

Director, Intelligent Transportation System Joint Program Office
(ITS JPO)

U.S. Department of Transportation (USDOT)

Presentation Overview

- Our Transportation Challenges
- USDOT Multimodal Collaboration
- ITS JPO Vision and Mission
- Where We're Headed – the *ITS Strategic Plan*
- Connected Vehicles
 - Safety Benefits
 - Mobility Benefits
 - Environmental Benefits
 - USDOT Decision on Connected Vehicles
 - Connected Vehicle Timeline
 - Connected Vehicle Pilots
 - Spectrum Sharing



Today's Transportation Challenges



Safety

- 32,719 highway deaths in 2013
- 5.6 million crashes in 2013
- Leading cause of death for ages 4, 11-27



Mobility

- 6.9 billion hours of travel delay
- \$160 billion cost of urban congestion



Environment

- 3.1 billion gallons of wasted fuel
- 56 billion lbs of additional CO₂



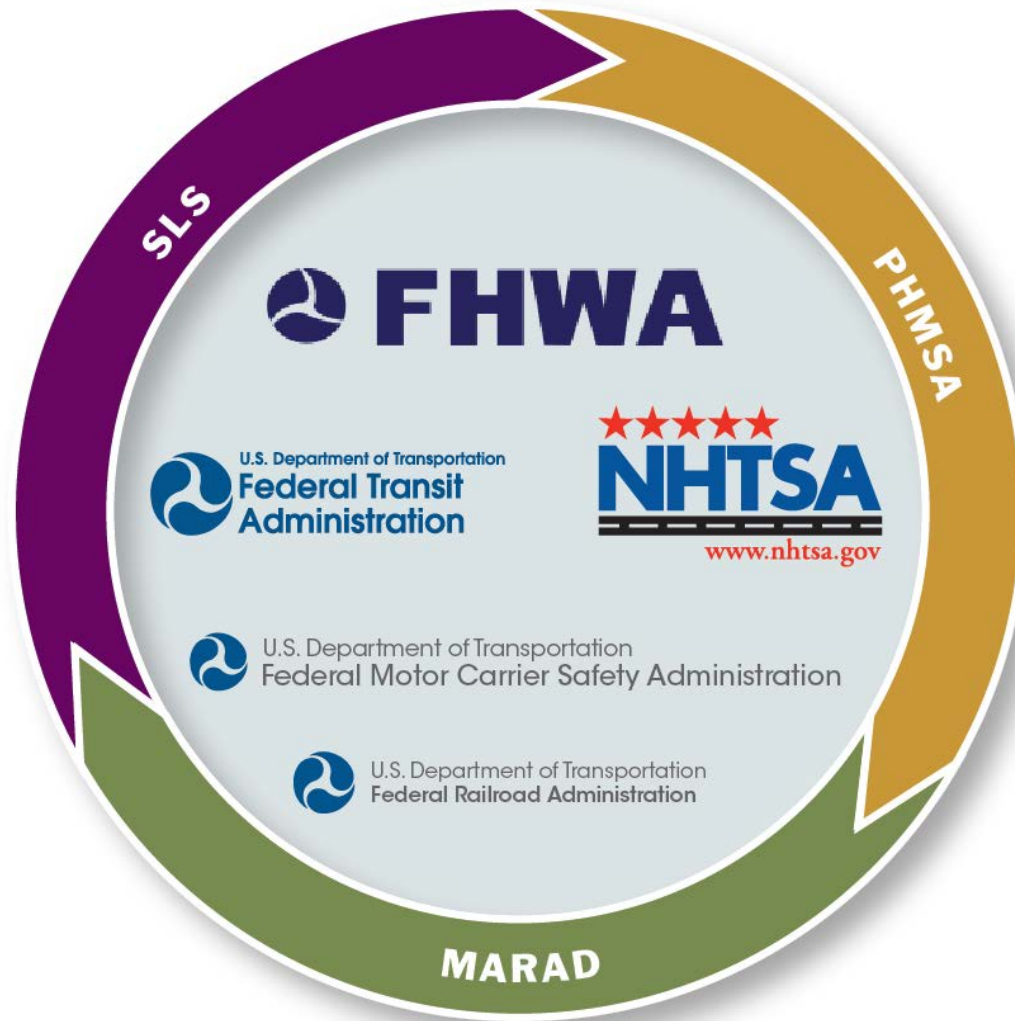
Data Sources:

Traffic Safety Facts: 2013 Data, National Highway Traffic Safety Administration (December 2014); 2015 Annual Urban Mobility Report, Texas Transportation Institute (Aug 2015); Centers for Disease Control



U.S. Department of Transportation
ITS Joint Program Office

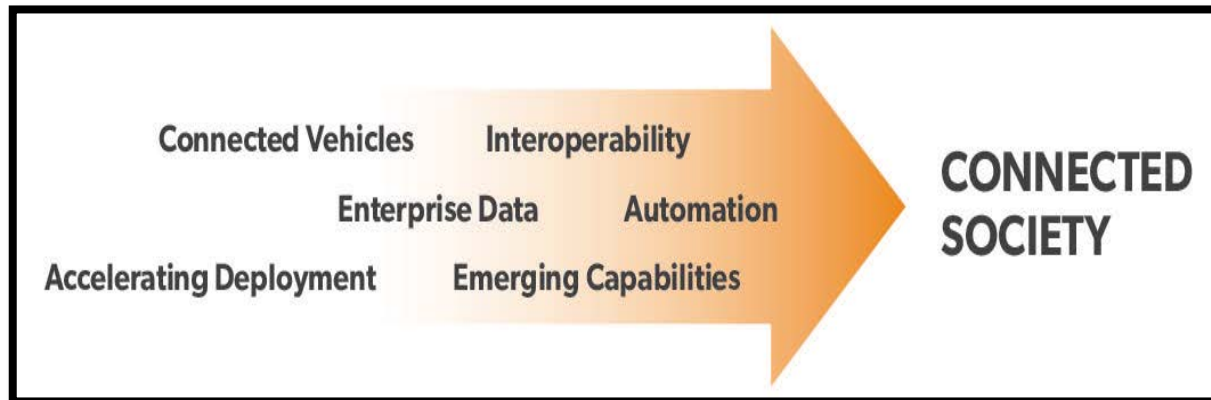
USDOT Modal Collaboration and Partnership



ITS JPO Vision and Mission

VISION

Transform the Way Society Moves



MISSION

Conduct research, development, and education activities to facilitate the adoption of information and communication technology to enable society to move more safely and efficiently.

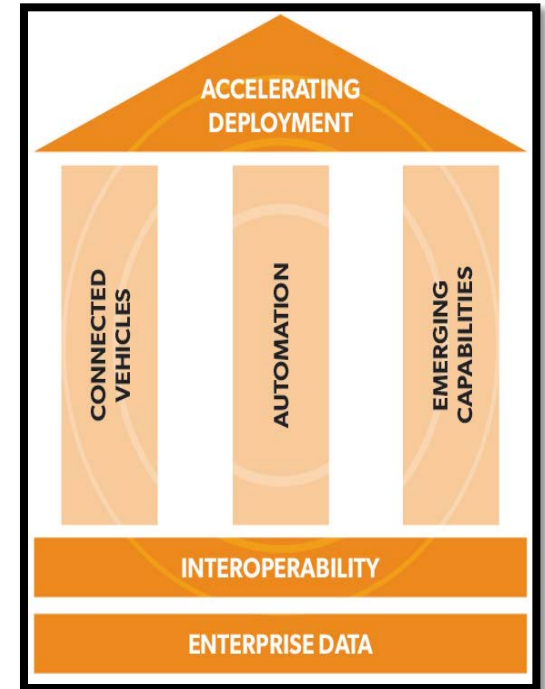


ITS Strategic Plan 2015-2019

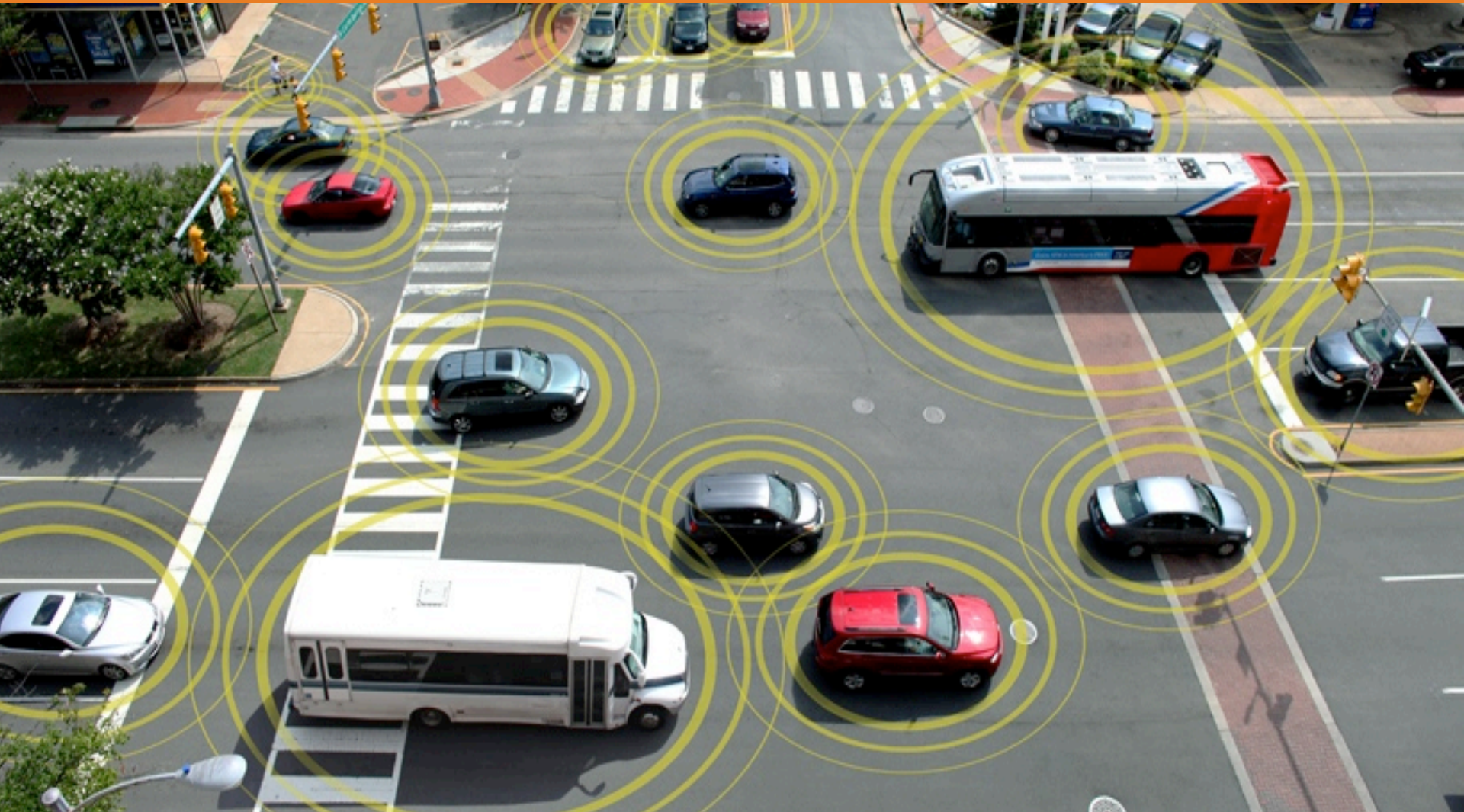


Program Categories

- **Connected Vehicles** program category will be primarily focused on adoption and eventual deployment of the system.
- **Automation research** will focus on topics related to automated road-vehicle systems and related technologies that transfer some amount of vehicle control from the driver to the vehicle.
- **Emerging Capabilities** will focus on future generations of transportation systems.
- **Enterprise Data** programs will continue existing efforts in operational data capture from stationary sensors, mobile devices, and connected vehicles, and expand into research activities involving the development of mechanisms for housing, sharing, analyzing, transporting, and applying those data for improved safety and mobility across all modes of travel.
- **Interoperability** focuses on how to ensure effective connectivity among devices and systems.
- **Accelerating Deployment** advances the work from adoption to wider scale deployment in coordination with several other DOT agencies.



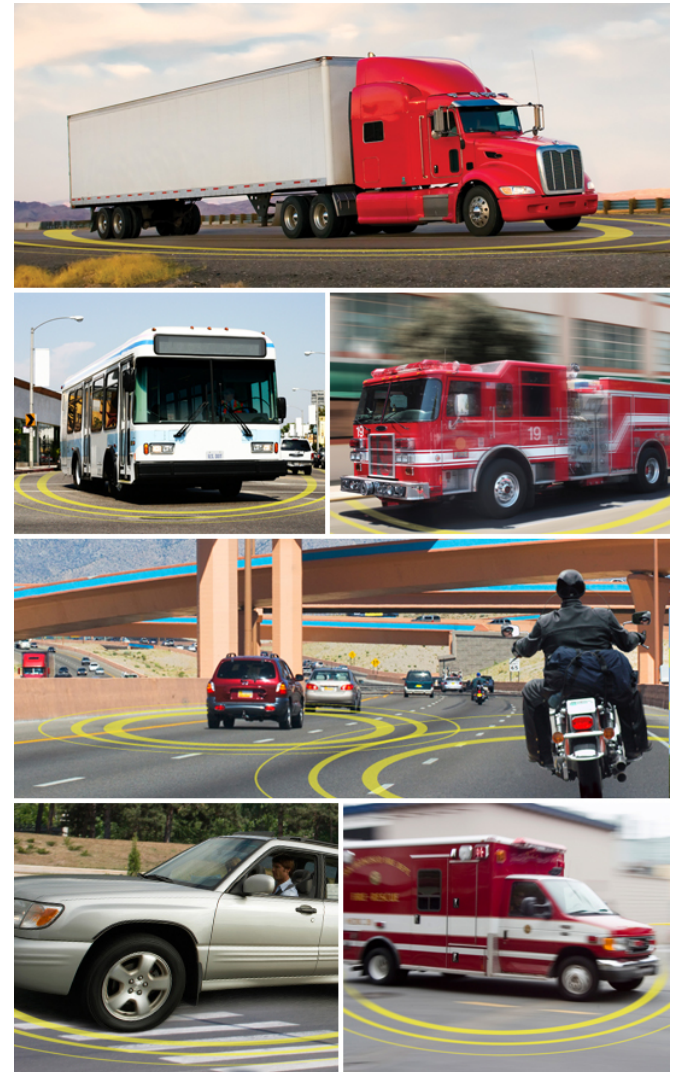
Connected Vehicles



Connected Vehicles

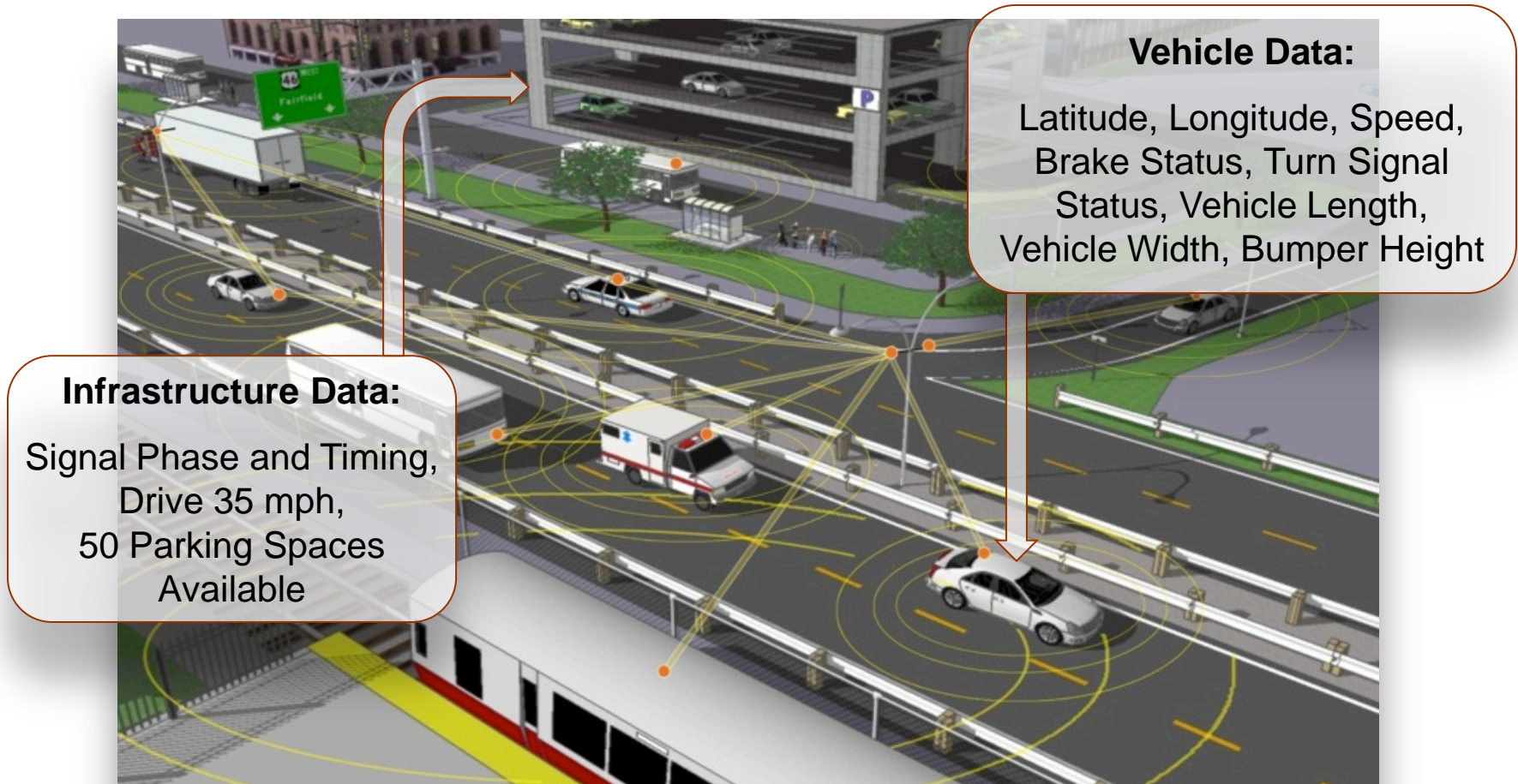
Connected vehicles are the future of transportation:

- Connected vehicles can save lives by significantly reducing traffic accidents
- Connected vehicles can make travel easier, more efficient, and more enjoyable
- Connected vehicles can help curb pollution
- Connected vehicles include all modes of transportation as well as pedestrians
- Connected vehicle research is a partnership between the USDOT, the auto industry, and other public and private researchers
- Connected vehicles are not a threat to your privacy

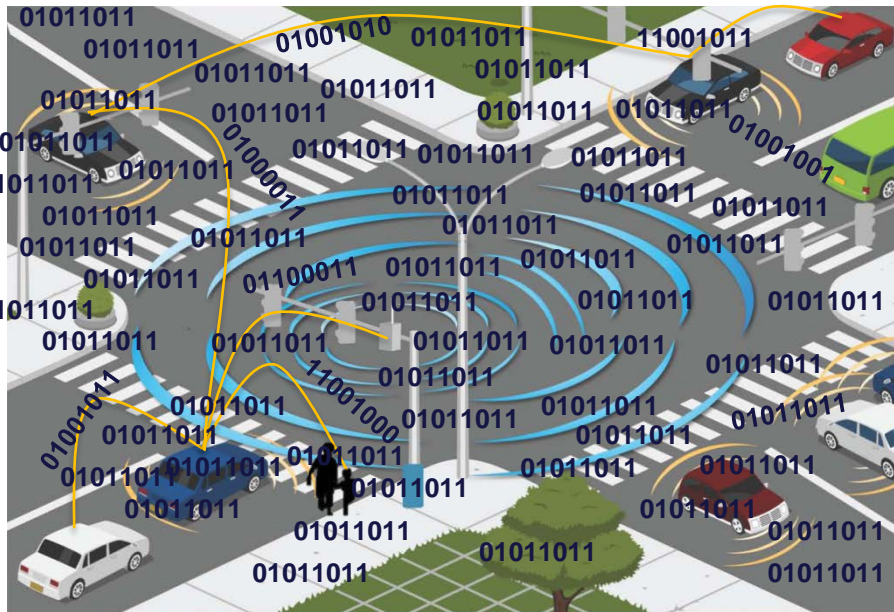


Connected Vehicle Concept

A connected vehicle system is based on wireless communication among vehicles of all types and the infrastructure.



Potential Data Explosion With Connected Vehicle Deployment



- Safety Pilot Model Deployment, Ann Arbor, MI
 - 2836 vehicles generating Basic Safety Messages on 73 miles of freeways and arterials (approx. 2% of vehicles)

Data Statistics	October 2012	April 2013
Number of Unique Vehicle IDs	1626	2069
Number of BSMs generated	1.3 Billion	2.7 Billion
BSM Storage Space	96 GB	197 GB

Challenges

- Data explosion imminent as connected vehicle research evolves to deployment phase
 - Significant challenges to data management and data analytics
- Will data communications swamp available channels?

Opportunities

- Use large amount of data collected from connected vehicles for better traffic management through enhanced situational awareness and prediction
 - Improve accuracy and speed of decision-making, thereby facilitating proactive management
 - Affords capability to determine causality of transportation problems, such as crashes, bottlenecks, delays, etc.
 - Provides comprehensive and accurate view of transportation systems



Connected Vehicle Safety Applications

Some of the vehicle-to-vehicle (V2V) safety apps in development include:

- **Intersection Movement Assist.** Warns the driver when it is not safe to enter an intersection—for example, when something is blocking the driver's view of opposing or crossing traffic
- **Left Turn Assist:** Notifies a driver who is attempting to make a left turn with oncoming traffic that it is not safe to proceed
- **Lane Change Warning/Blind Spot Warning:** Warns drivers when changing lanes if there is a car in their blind spot
- **Forward Collision Warning:** Warns drivers if a vehicle ahead is stopped or traveling slower and there is a potential risk of collision



Connected Vehicle Safety Applications (cont.)

- **Emergency Electric Brake Light Warning:** Notifies the driver if there is a sudden-braking vehicle ahead (or several vehicles ahead)
- **Do Not Pass Warning:** Warns the driver if it is not safe to pass a slower-moving vehicle using a passing zone occupied by vehicles traveling in the opposite direction
- **Vehicle Turning Right in Front of Bus Warning:** Warns a bus driver if the application detects the presence of vehicles attempting to go around the bus to make a right turn when the bus departs from a bus stop

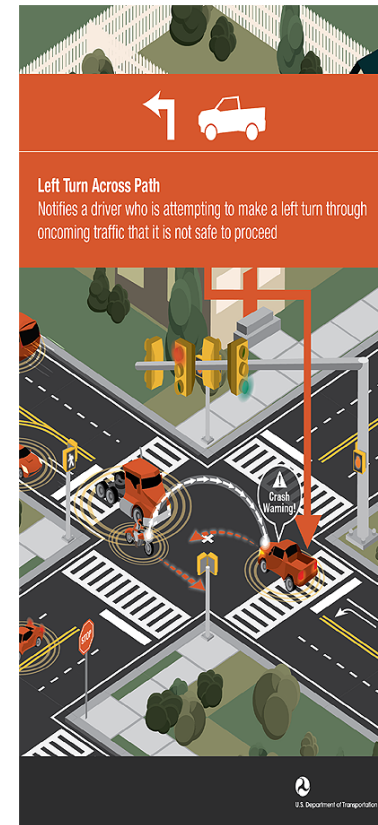


Safety Benefits of Connected Vehicles

- NHTSA studied the safety benefits of two V2V applications: Intersection Movement Assist (IMA) and Left Turn Assist (LTA).



IMA: Warns the driver when it is not safe to enter an intersection—for example, when something is blocking the driver's view of opposing or crossing traffic



LTA: Notifies a driver who is attempting to make a left turn with oncoming traffic that it is not safe to proceed

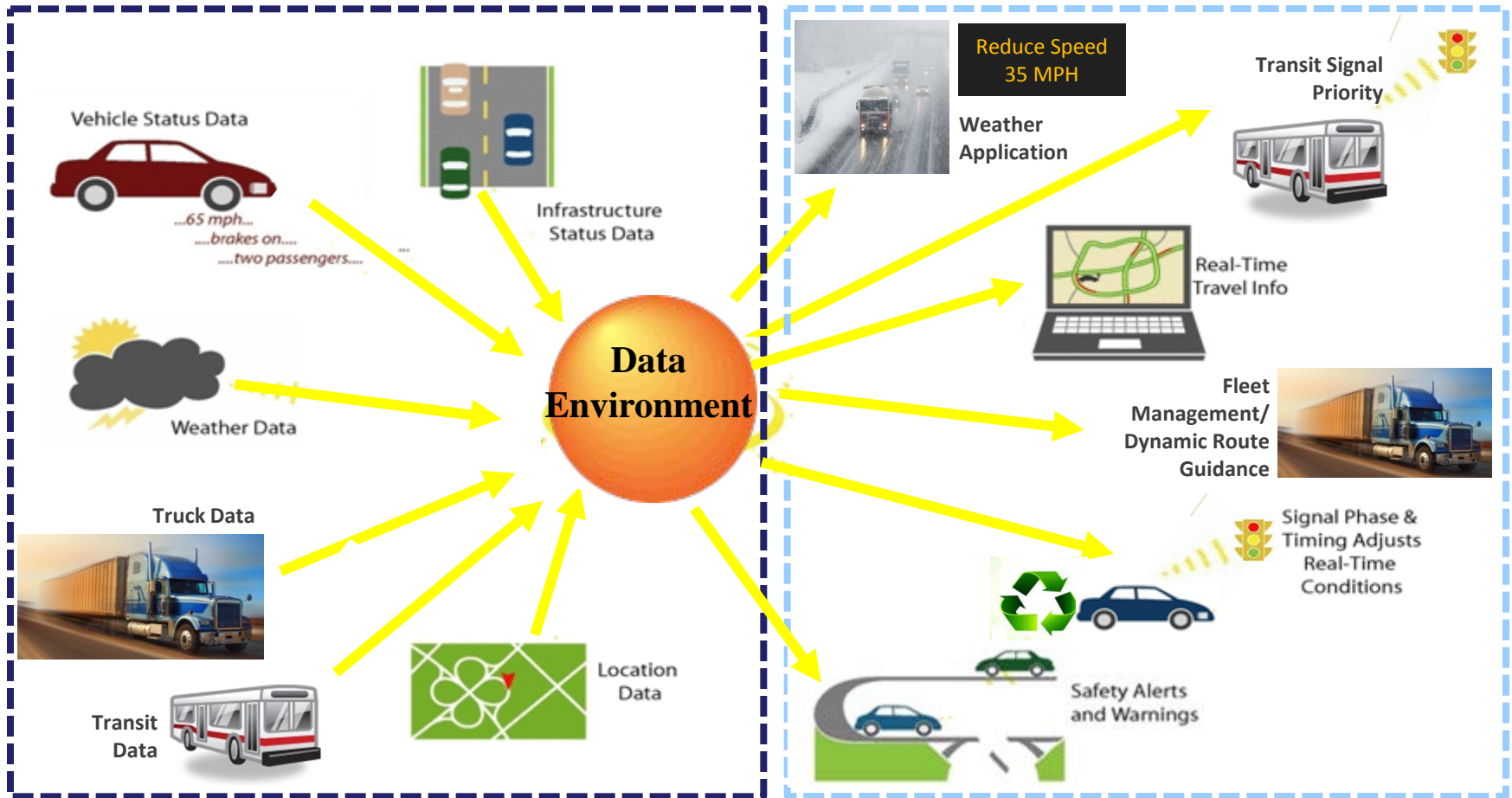
- ***NHTSA estimates that IMA and LTA would potentially prevent up to 592,000 crashes and save up to 1,083 lives annually***



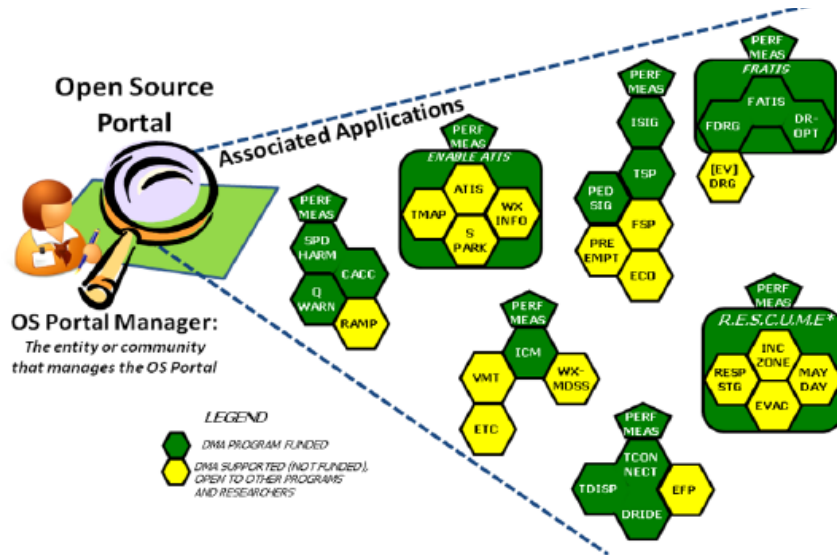
Mobility – Better Data, Many Applications









Real Time Data Capture & Management

Dynamic Mobility Applications



V2I Mobility Applications



MMITSS: Multimodal Intelligent Traffic Signal System	
INFLO: Intelligent Network Flow Optimization	
R.E.S.C.U.M.E.: Response, Emergency Staging and Communications, Uniform Management, and Evacuation	
Enable ATIS: Enable Advanced Traveler Information Systems	
IDTO: Intelligent Dynamic Transit Operations	
FRATIS: Freight Advanced Traveler Information Systems	
Other Programs: ICM ATDM	 Weather 



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

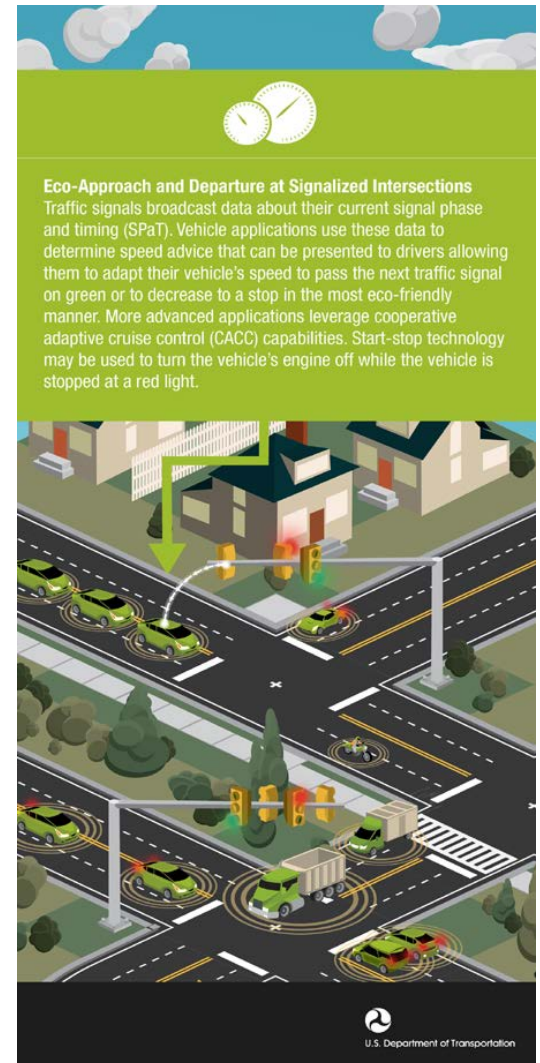
- **Vision** – Cleaner Air through Smarter Transportation
- **Objectives** – Investigate whether it is possible and feasible to:
 - Identify connected vehicle applications that could provide environmental impact reduction benefits such as reduced fuel use, improved vehicle efficiency, and reduced emissions.
 - Facilitate and incentivize “green choices” by transportation service consumers (e.g., system users, system operators, policy decision makers).
 - Identify V2V, V2I, and vehicle-to-grid (V2G) data (and other) exchanges via wireless technologies of various types.
 - Model and analyze connected vehicle applications to estimate the potential environmental impact reduction benefits.
 - Develop a prototype for one of the applications to test its efficacy and usefulness.



Connected Vehicle Environmental Applications

Some of the environmental apps being researched include:

- ***Eco Approach and Departure at Signalized Intersections:*** Presents information to drivers about traffic signal timing, allowing drivers to adapt their speed to pass the signal on green or decrease speed to a stop in the most eco-friendly way possible.
- ***Eco-Traffic Signal Priority:*** Gives signal priority to transit vehicles approaching a signalized intersection, considering the vehicle's location, speed, type, schedule, and number of passengers--to produce the fewest emissions at signalized intersections.
- ***Eco-Traffic Signal Timing:*** Traffic signals collect data such as vehicle type, location, speed and emissions from vehicles to optimize traffic signal timing.



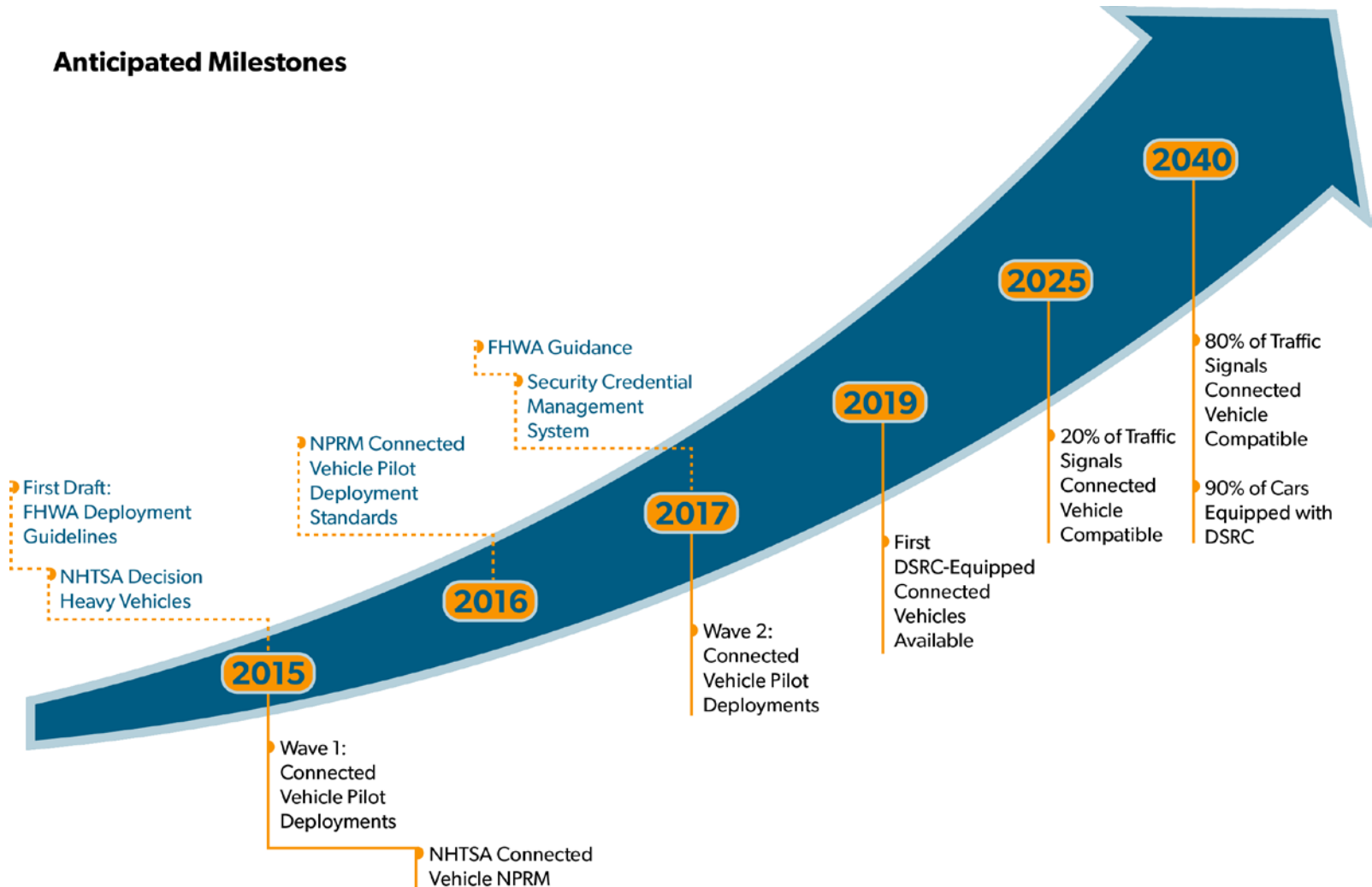
USDOT Decision on Connected Vehicles

- In August of 2014, the National Highway Traffic Safety Administration (NHTSA) gave V2V communications technology the green light and is working on a regulatory rulemaking that will require the technology to be installed in all new light vehicles in the coming years.
- In May 2015, Secretary Foxx announced the USDOT would accelerate the deployment of connected vehicles. NHTSA will move ahead of its timetable for the proposed V2V rule. The proposal is expected in 2015, rather than 2016.
- In the fall of 2015, the Federal Highway Administration (FHWA) will release a V2I guidance document to assist transportation managers and operators interested in adapting their traffic signals and other roadside devices so they are compatible with the new connected vehicles.
- New cars with connected vehicle technology are expected to be available by 2016.



Connected Vehicle Timeline

Anticipated Milestones



Connected Vehicle Pilot Deployment Program

CV Pilot Program Goals



Proposed Program Schedule

- Summer-Fall 2014 - Regional Pre-Deployment Workshops/Webinars
- Early 2015 - Solicitation for Wave 1 Pilot Deployment Concepts
- September 2015 - Wave 1 Pilot Deployments Awards
- Early 2017 - Solicitation for Wave 2 Pilot Deployment Concepts
- September 2017 - Wave 2 Pilot Deployments Award(s)
- September 2020 - Pilot Deployments Complete

Resources

- ITS JPO Website: <http://www.its.dot.gov/>
- CV Pilots Program Website: <http://www.its.dot.gov/pilots>



Wyoming



New York
City



Connected Vehicle

Pilot Deployment Program



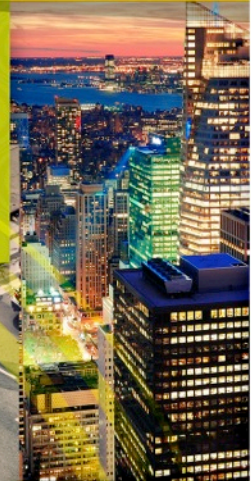
Tampa, Florida





Photo Courtesy: MTA New York City Transit

New York City



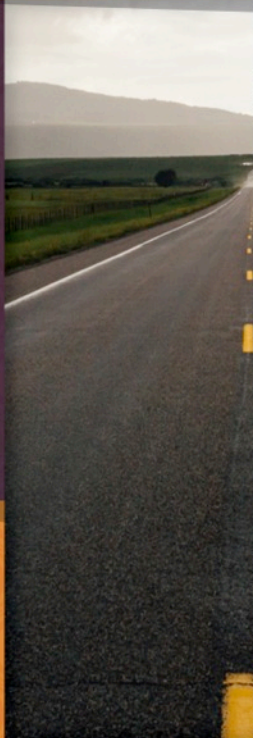


Tampa, Florida



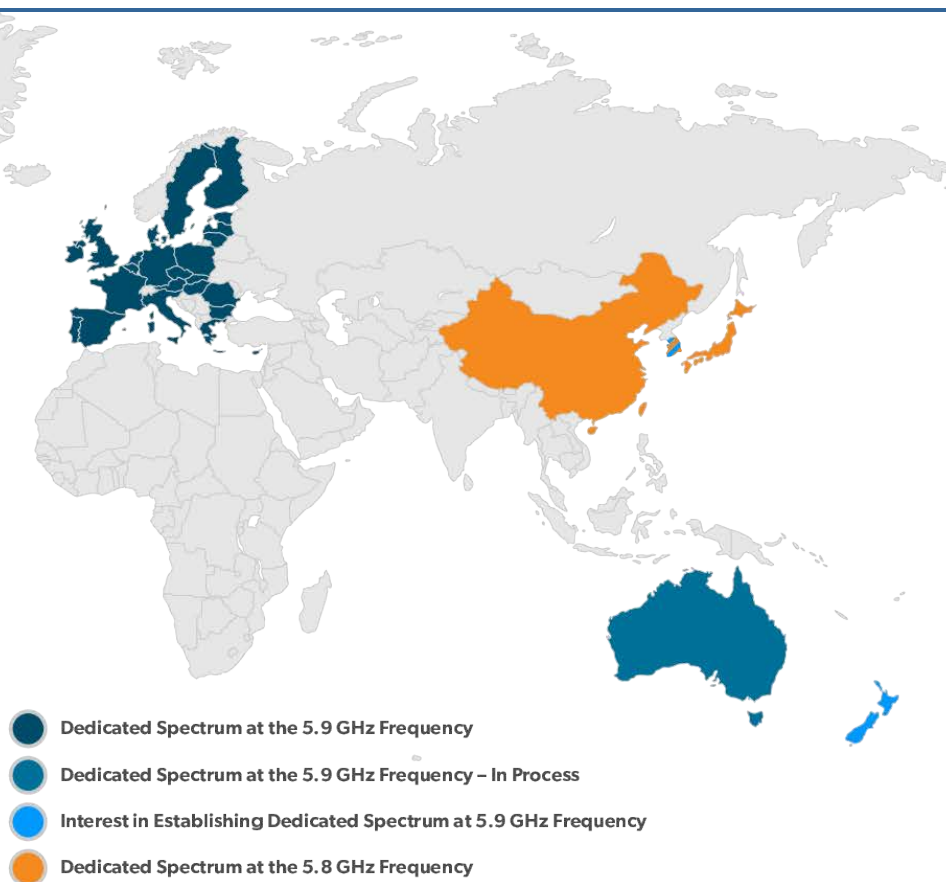


Wyoming



5.9 GHz Spectrum Sharing

- **Federal Communication Commission (FCC) Notice of Proposed Rulemaking:** The FCC is seeking to open up additional spectrum for unlicensed Wi-Fi devices within the 5.9 GHz band, which serves as the platform for connected vehicle technology.
- **5.9 GHz Spectrum:** The connected vehicle environment that is being researched is based on reliable access to the 5.9 GHz wireless spectrum.



- **Spectrum Sharing:** Any changes to the 5.9 GHz spectrum may jeopardize crash avoidance capabilities.

For More Information

United States Department of Transportation

OFFICE OF THE ASSISTANT SECRETARY FOR RESEARCH AND TECHNOLOGY
Intelligent Transportation Systems
Joint Program Office

About | Research | Tech Transfer | Library | Press Room | ITS PCB Program | Contact Us

Planning for the Future of ITS

ITS 2015-2019 STRATEGIC PLAN

The U.S. Department of Transportation's plans for the future of ITS Research are available now!

LAUNCH NOW

FREE ITS TRAINING

Public Meetings & Webinars

Connected Vehicle TEST BED

CV Pilots Deployment Project

ITS & YOU

Current Research

- + Safety
- + Mobility
- + Environment
- + Road Weather
- + Policy
- + Connected Vehicle Technology
- + Short-Term, Intermodal Research
- + Exploratory
- + ITS Cross-Cutting Support
- + Success Stories

All Research >>

Spotlight

December 10, 2014
The U.S. Department of Transportation Plans for the Future of Intelligent Transportation Systems (ITS) ...
Read more

December 10, 2014
The Connected Vehicle Reference Implementation Architecture (CVRIA) Training Course Is Now Available ...
Read more

August 12, 2014
The USDOT Connected Vehicles Pilot Deployment Program Webinar Series Part 1: Concept, Phases, Waves, and Partnerships with Kate Hartman ...
Read more

More News >>

Office of the Assistant Secretary for Research and Technology (OST-R) • U.S. Department of Transportation (US DOT)
1200 New Jersey Avenue, SE • Washington, DC 20590 • 800.853.1351 • E-mail OST-R

Accessibility | Disclaimer | Fast Lane | FedStats | Freedom of Information Act | No FEAR Act | OIG Hotline | Privacy Policy | USA.gov | White House

Plug-ins: PDF Reader | Flash Player | Excel Viewer | PowerPoint Viewer | Word Viewer | WinZip

OST-R's privacy policies and procedures do not necessarily apply to external web sites. We suggest contacting these sites directly for information on their data collection and distribution policies.

Kenneth Leonard

USDOT / ITS JPO

ken.leonard@dot.gov

[Twitter: @ITSJPODirector](https://twitter.com/ITSJPODirector)

[Facebook:
https://www.facebook.com/DOTRITA](https://www.facebook.com/DOTRITA)

[Website:
http://www.its.dot.gov](http://www.its.dot.gov)

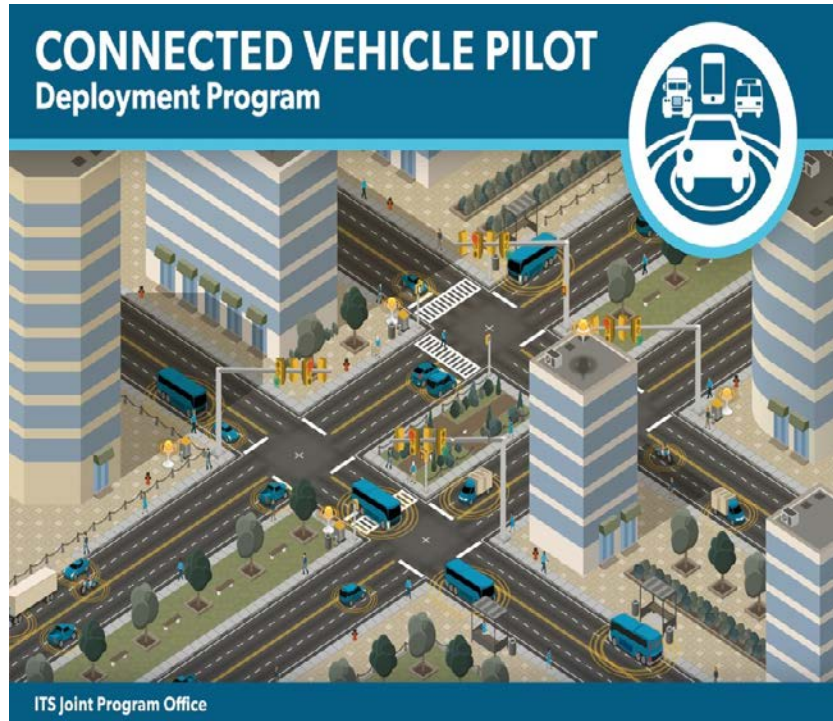
Questions or Comments?



Backup Slides



Connected Vehicle Pilot Organizing Principles



- Pilot deployments will be ***needs-driven*** and have measureable impact.
- Successfully deployed technologies are expected to remain as ***permanent operational elements***.
- There will be ***multiple pilot sites***. Each site will have different needs, focus, and applications.
- Each pilot deployment will feature ***multiple applications*** drawing on the products of USDOT and other connected vehicle research.



2015 FHWA Guidance Will Help Communities Prepare for Connected Vehicles

- The FHWA is developing policy positions, guidance, guidelines, whitepapers, and practitioner tools to promote the smooth deployment of V2I technology by transportation system owners/ operators.
- The FHWA will issue initial guidance in late 2015. This initial guidance is intended to assist in planning for future investments and deployment of V2I systems.
- The guidance does not impose any new requirements on local governments.
- This work will be harmonized with related efforts by other USDOT modal agencies.
- Subsequent guidance updates will also incorporate ITS research findings.



Help develop the FHWA's
2015 Guidance for
Connected Vehicles.
Add your comment.



Overview of the FHWA Guidance

- *It is not a requirement* to implement infrastructure.
- It is a tool kit for local communities to implement infrastructure and supporting systems for connected vehicles.
- It identifies high-priority applications that local communities should consider installing, including:
 - V2I safety applications (crash warnings at traffic signals, etc.)
 - Dynamic mobility applications
 - Road-weather applications
 - Environmental applications
- It is based on DOT research and ITS JPO-funded AASHTO analysis of infrastructure needs and deployment approaches.

