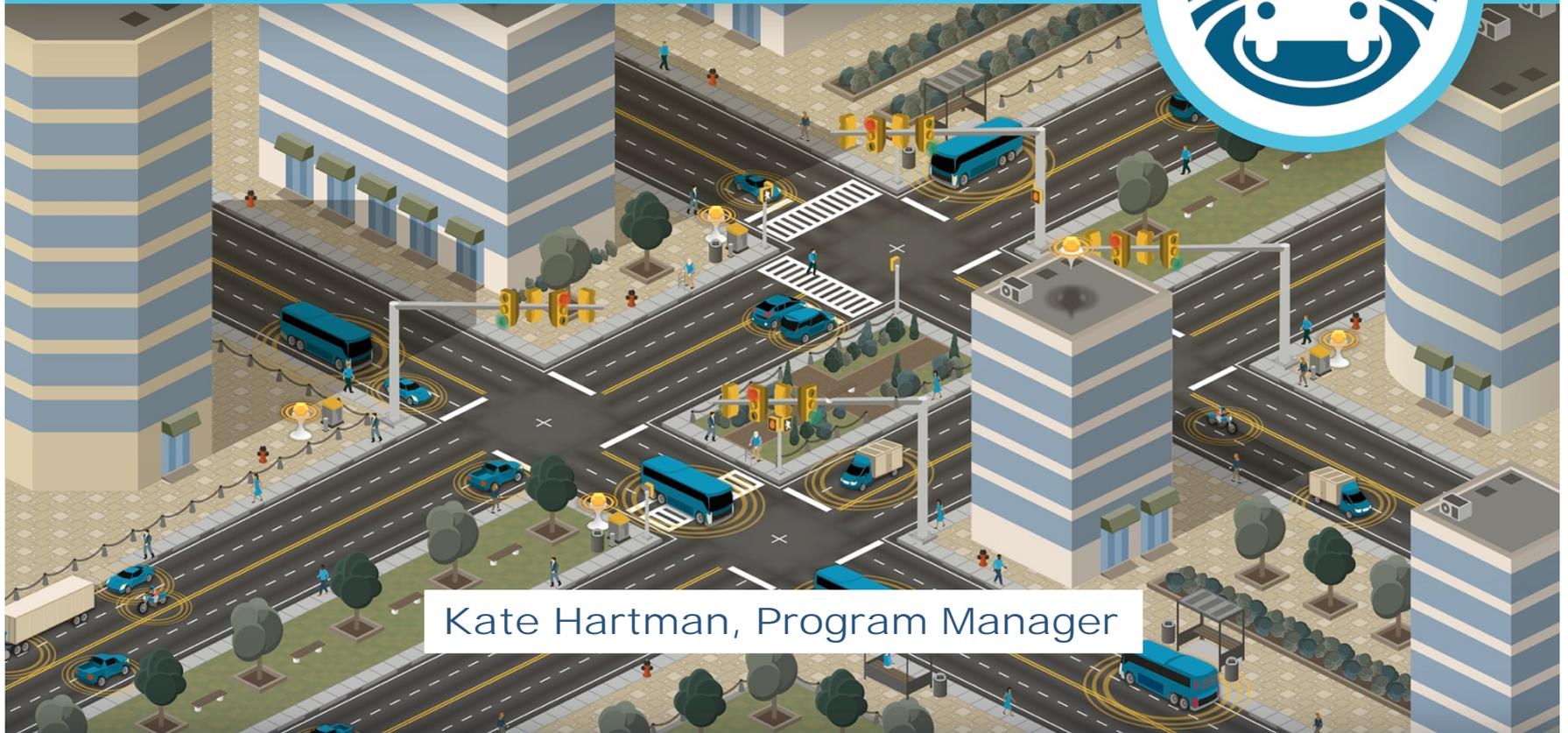




CONNECTED VEHICLE PILOT Deployment Program



Kate Hartman, Program Manager

PROGRAM GOALS





ORGANIZING PRINCIPLES

- Pilots will be pilot deployments, that is, real-world environment deployments
 - If successful, deployed technologies are expected to remain as permanent operational elements

- There will be multiple pilot sites over time
 - Each site will have different needs, focus and applications
 - That is, pilot deployments must address a critical problem
 - The needs of each site must drive the application selection process

- Pilot deployments are expected to be both large-scale and multi-modal
 - Large-scale implies pilot deployments will have measureable impact, not a specific minimum geographic or vehicle fleet size
 - Sites will deploy multiple applications drawing on the products of USDOT and other connected vehicle research



PROPOSED PILOT DEPLOYMENT REQUIREMENTS



- Multiple connected vehicle applications must be deployed together
 - Cost-effectively leveraging captured CV and mobile device data
 - Address multi-modal problems

- Pilot deployments should leverage USDOT-sponsored research
 - Need not include all applications (in fact, this is unlikely to be practical)
 - May include new connected vehicle applications not considered by USDOT
 - All applications selected must work and have an impact

- Pilot deployments should include the capture of data from multiple sources
 - At a minimum, vehicles must represent one source of data used in the pilot deployment



PROPOSED PILOT DEPLOYMENT REQUIREMENTS



- Multiple forms of communications technologies are desired
 - DSRC desired as one communication technology
 - Integrated or carry-in devices for connected vehicles capable of generating an SAE J2735 Basic Safety Message (BSM)

- Well-defined, focused, quantitative performance measures
 - Support an independent evaluation effort

- Share pilot deployment data and lessons learned
 - While protecting privacy and intellectual property

- Security and credentialing management system





PILOT DEPLOYMENT WAVES AND PHASES

- The USDOT expects an initial set of pilot deployments (**Wave 1**) to begin in Fall 2015, and a second wave (**Wave 2**) in 2017.

- Proposed Deployment **Phases** within each Wave
 - Concept Development (6-9 months)
 - Concept of Operations, System Requirements, Preliminary Site Plans
 - Design/Build/Test (10-14 months)
 - Develop and integrate applications with legacy systems, test enhanced system
 - Operate and Maintain (18 months)
 - Operate enhanced system and assess performance against targets





PARTNERSHIPS

- Strong Partnerships Are An Expected Feature of Pilot Deployments
 - Encourage partnerships of multiple stakeholders, including, as needed:
 - Public sector partners (e.g., agencies, planning organizations, localities)
 - Private sector partners (e.g., technology vendors, integrators, OEMs)
 - Academic and research Institutions
 - Potential organizational structures
 - Options where private sector or public sector organizations may lead
 - Single point of responsibility/control a desired attribute of pilot deployments
 - No “template” for how individual pilot deployments should/must be organized





CONNECTED VEHICLE APPLICATIONS

- The USDOT has made a significant investment in foundational research and initial development of connected vehicle applications
 - Concepts of Operations
 - System Requirements
 - Prototype Design and Testing
 - Prototype Impacts Assessment
 - Analytics, Modeling and Simulation to Assess Potential Long-Term Impacts

- Not all CV Application efforts are in the same state of maturity, few are complete
 - But a large number of application development efforts across multiple programs will be substantively complete in late 2014



CONNECTED VEHICLE APPLICATIONS

V2I Safety

Red Light Violation Warning
 Curve Speed Warning
 Stop Sign Gap Assist
 Spot Weather Impact Warning
 Reduced Speed/Work Zone Warning
 Pedestrian in Signalized Crosswalk
 Warning (Transit)

V2V Safety

Emergency Electronic Brake Lights
 (EEBL)
 Forward Collision Warning (FCW)
 Intersection Movement Assist (IMA)
 Left Turn Assist (LTA)
 Blind Spot/Lane Change Warning
 (BSW/LCW)
 Do Not Pass Warning (DNPW)
 Vehicle Turning Right in Front of Bus
 Warning (Transit)

Agency Data

Probe-based Pavement Maintenance
 Probe-enabled Traffic Monitoring
 Vehicle Classification-based Traffic
 Studies
 CV-enabled Turning Movement &
 Intersection Analysis
 CV-enabled Origin-Destination Studies
 Work Zone Traveler Information

Environment

Eco-Approach and Departure at
 Signalized Intersections
 Eco-Traffic Signal Timing
 Eco-Traffic Signal Priority
 Connected Eco-Driving
 Wireless Inductive/Resonance
 Charging
 Eco-Lanes Management
 Eco-Speed Harmonization
 Eco-Cooperative Adaptive Cruise
 Control
 Eco-Traveler Information
 Eco-Ramp Metering
 Low Emissions Zone Management
 AFV Charging / Fueling
 Information
 Eco-Smart Parking
 Dynamic Eco-Routing (light
 vehicle, transit, freight)
 Eco-ICM Decision Support System

Road Weather

Motorist Advisories and Warnings
 (MAW)
 Enhanced MDSS
 Vehicle Data Translator (VDT)
 Weather Response Traffic
 Information (WxTINFO)

Mobility

Advanced Traveler Information System
 Intelligent Traffic Signal System
 (I-SIG)
 Signal Priority (transit, freight)
 Mobile Accessible Pedestrian Signal
 System (PED-SIG)
 Emergency Vehicle Preemption (PREEMPT)
 Dynamic Speed Harmonization (SPD-
 HARM)
 Queue Warning (Q-WARN)
 Cooperative Adaptive Cruise Control
 (CACC)
 Incident Scene Pre-Arrival Staging
 Guidance for Emergency Responders
 (RESP-STG)
 Incident Scene Work Zone Alerts for Drivers
 and Workers (INC-ZONE)
 Emergency Communications and
 Evacuation (EVAC)
 Connection Protection (T-CONNECT)
 Dynamic Transit Operations (T-DISP)
 Dynamic Ridesharing (D-RIDE)
 Freight-Specific Dynamic Travel Planning
 and Performance
 Drayage Optimization

Smart Roadside

Wireless Inspection
 Smart Truck Parking



PILOT DEPLOYMENT PROCESS

- **Pilot Deployment Concept Development Process**
 - Identify Local Needs
 - Set Performance Goals
 - Select CV Applications That Work Together Meet Those Goals

- **USDOT Sample Pilot Concepts from Hypothetical Locations**
 - Hypothetical, but realistic examples of localities applying the pilot deployment concept development process

SCENARIO 1: DOWNTOWN SUNNYSIDE

~ IDENTIFY KEY TRANSPORTATION CHALLENGES ~



▪ Mobility

- Heavy congestion at peak times
- Transit vehicles schedule reliability

▪ Safety

- Pedestrian-vehicle conflicts
- Crashes in unprotected left hand turns

▪ Environment

- Emissions/Air Quality hot spots
- Poor progression results in wasted fuel

SCENARIO 1: DOWNTOWN SUNNYSIDE

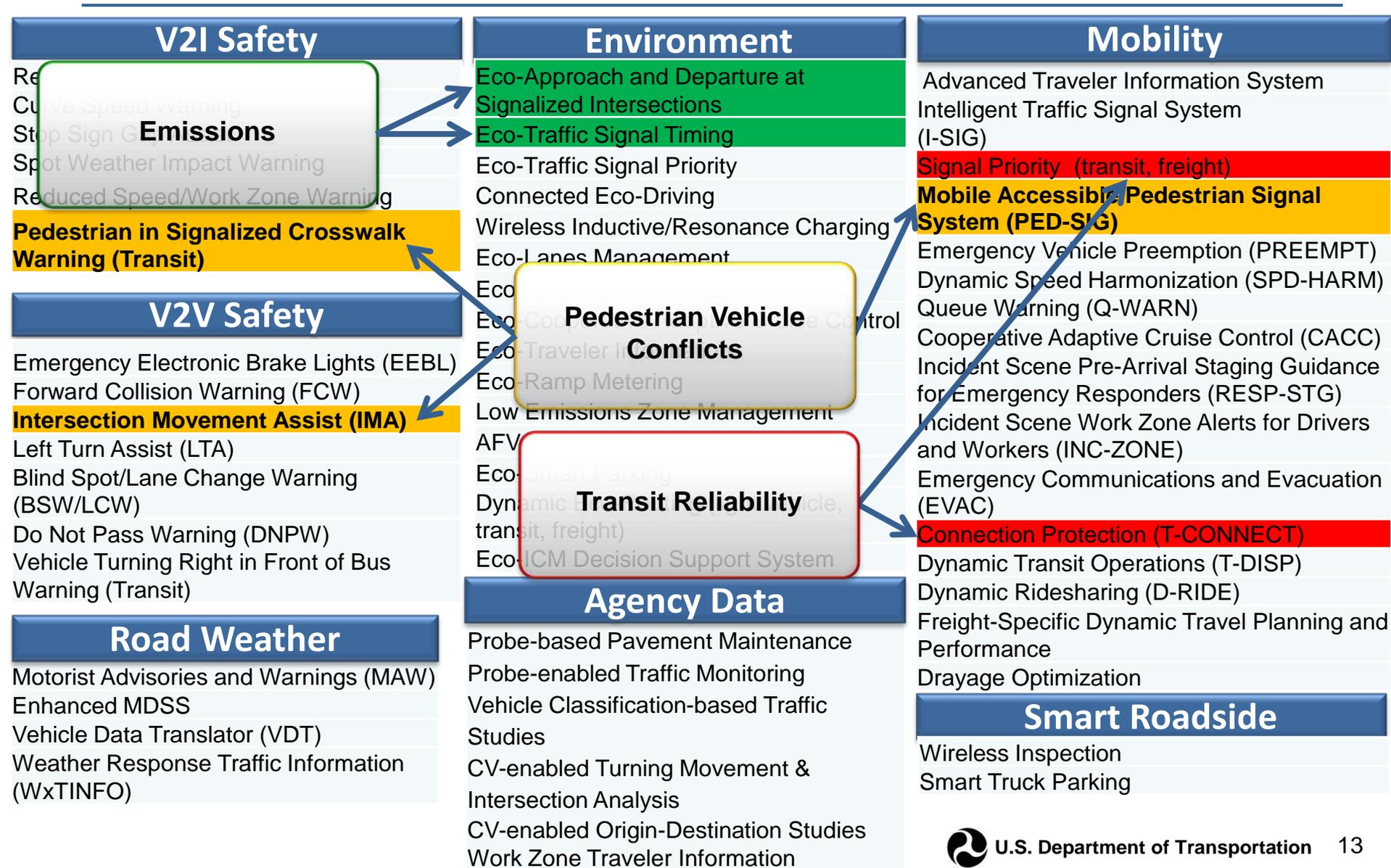
~ STAKEHOLDERS SET THREE PERFORMANCE TARGETS ~

Goal	Performance Measure	Performance Target
Increase transit reliability	Transit schedule adherence	Transit vehicles on schedule 90% of the time
Improve pedestrian safety	Pedestrian-vehicle conflicts	Reduce pedestrian-vehicle conflicts by 50%
Improve hot spot air quality	Total emissions	Reduce emissions by 20%



SCENARIO 1: DOWNTOWN SUNNYSIDE

~ APPLICATIONS SELECTED ~



SCENARIO 1: DOWNTOWN SUNNYSIDE

~ IMPROVING CONGESTION IN AN URBAN ARTERIAL NETWORK ~

Improve Transit Reliability

- Connection Protection
- Transit Signal Priority

Improve Pedestrian Safety

- Mobile Accessible Pedestrian Signal System
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist

Improve Air Quality

- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing



Synergies among applications increase benefits and reduce costs



SCENARIO 3: GREYPOOL COUNTY

~ Improving Safety and Mobility in a Rural Area ~

Increase Accessibility

- Dynamic Transit Operations

Improve Safety

- Red Light Violation Warning
- Stop Sign Gap Assist
- Left Turn Assist

Informing Drivers During Bad Weather

- Weather Response Traffic Information



Synergies among applications increase benefits and reduce costs



SCENARIO 4: DISTRICT 13 OPERATIONS

~ Improving the Efficiency of Road Maintenance ~

Improve Snow Removal

- Enhanced Maintenance Decision Support System

Improve Management of Work Zones

- Work Zone Traveler Information



Improve Situational Awareness

- Probe-based Pavement Maintenance

Synergies among applications increase benefits and reduce costs



SCENARIO 5: I-876 CORRIDOR

~ Improving Freight Movement in an Inter-State Corridor ~

Improve Freight Productivity

- Freight Advanced Traveler Information System
- Drayage Optimization
- Freight Signal Priority

Improve Truck Safety

- Curve Speed Warning
- Do Not Pass Warning/Lane Change Warning



Synergies among applications increase benefits and reduce costs



CONNECTED VEHICLE PILOT DEPLOYMENT SCHEDULE



- Proposed CV Pilots Deployment Schedule

Schedule Item	Date
Regional Pre-Deployment Workshop/Webinar Series	Summer-Fall 2014
Solicitation for Wave 1 Pilot Deployment Concepts	Early 2015
Wave 1 Pilot Deployments Award(s) Concept Development Phase (6-9 months) Design/Build/Test Phase (10-14 months) Operate and Maintain Phase (18 months)	September 2015
Solicitation for Wave 2 Pilot Deployment Concepts	Early 2017
Wave 2 Pilot Deployments Award(s) Concept Development Phase (6-9 months) Design/Build/Test Phase (10-14 months) Operate and Maintain Phase (18 months)	September 2017
Pilot Deployments Complete	September 2020

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





UPCOMING OUTREACH ACTIVITY

- Webinar Series
 - Kicking off in late August
 - One “hot topic” per month
 - Exact schedule still to be finalized
 - Topics will include: Role of DSRC, Performance Measure Identification, Security and Credential Management, Role of Mobile Devices

- Workshops
 - One-hour of CV 101 Workshop at Detroit World Congress will focus on CV Pilots
 - Finalizing plans for workshops in September-November Time Frame

- Check the CV Pilots website (<http://www.its.dot.gov/pilots>) to keep up to date
 - Adding detail and resources for each CV application over next 8-12 weeks
 - Linking documents and resources associated with each individual application to the CV Pilots website



Resources



www.itsforge.net

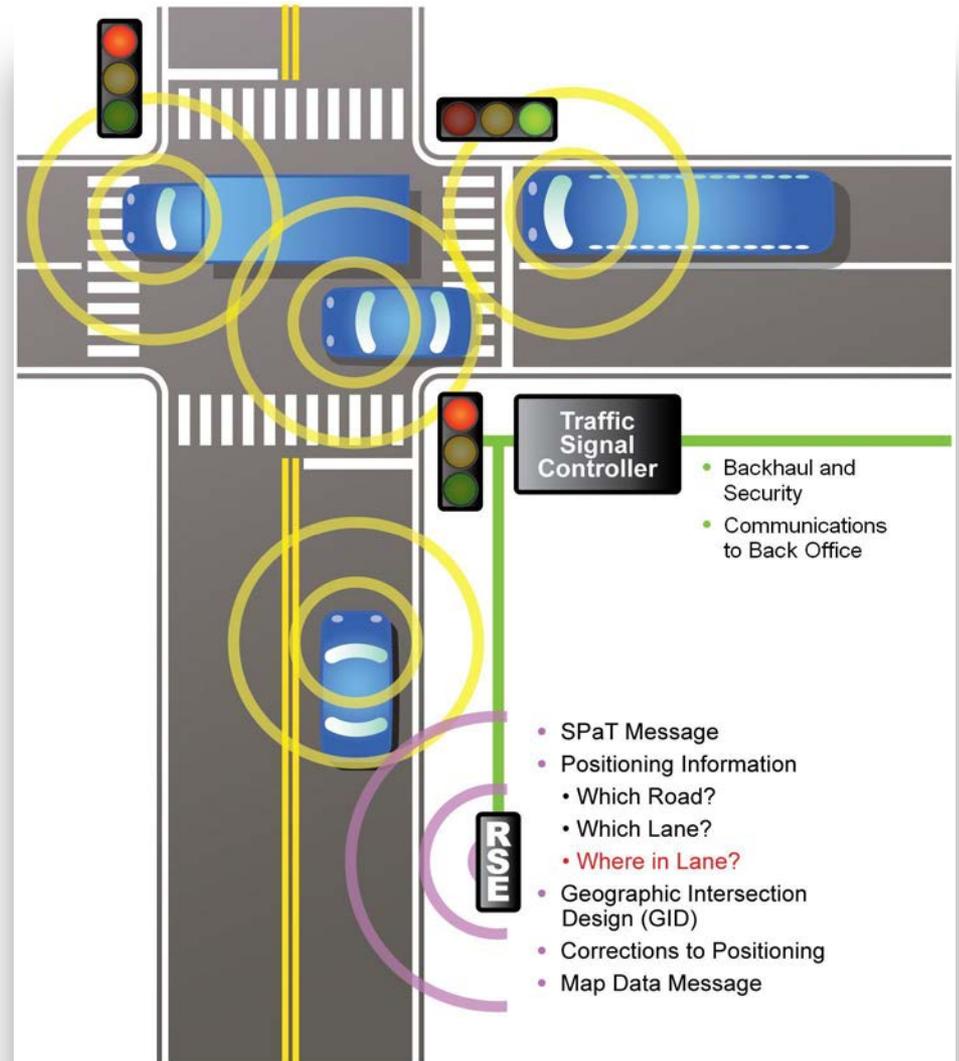


- Portal for sharing documentation and source code from USDOT-sponsored application prototyping efforts
- By end of 2014, will be populated with materials describing 20+ connected vehicle applications
- Contributed code must meet documentation guidelines
- Search and download functions
- In prototype form now
 - Enhanced Release 1 expected **Fall 2014**



V2I REFERENCE IMPLEMENTATION

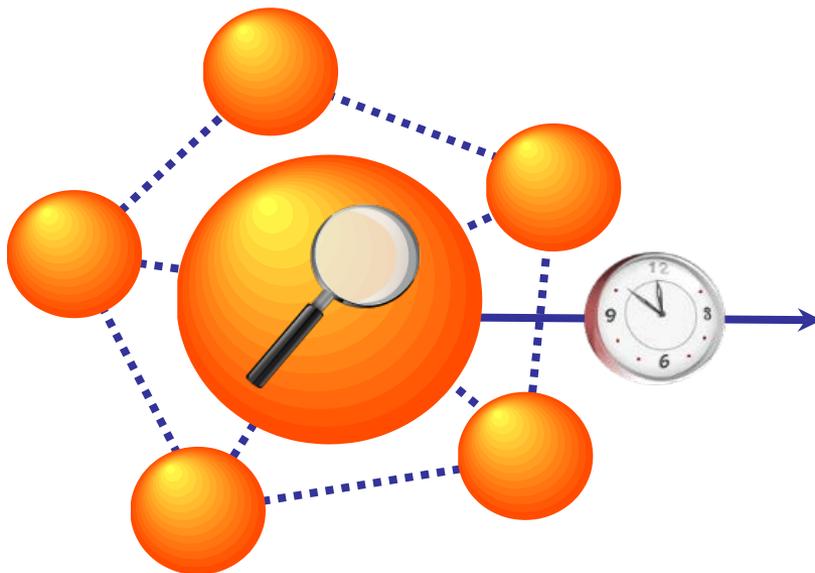
- A system of specifications and requirements that allow the various components of V2I hardware, software, and firmware to work together
- An agency will be able to select the capabilities and applications desired at a given installation
- Integrated V2I Prototype
 - Initial testing late 2014
 - Field testing in Orlando early 2015



RESEARCH DATA EXCHANGE



www.its-rde.net



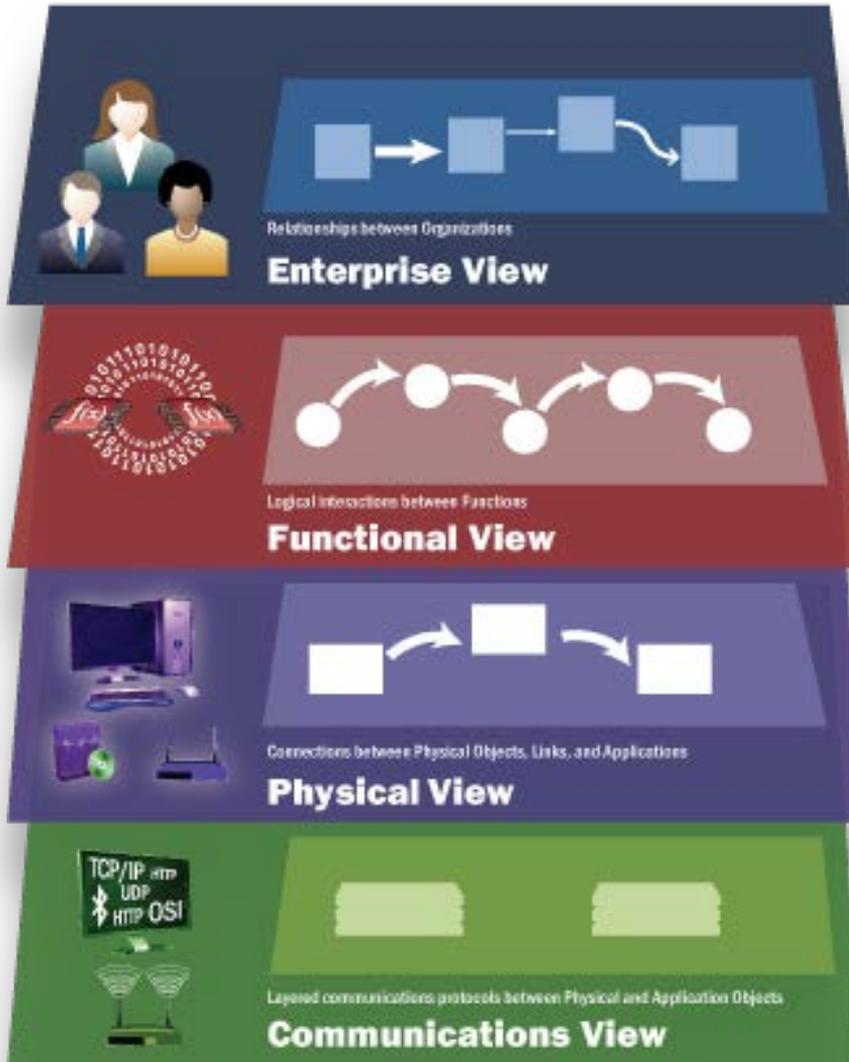
- Promotes sharing of archived and real-time connected vehicle data collected in USDOT-sponsored research efforts and field tests
- 2 TB of well-organized and documented data
- Drawn from a dozen geographic locations across the country
- Multi-source data (traditional sensor plus probe and connected vehicle data)
- Search and download functions
- RDE Release 2.0 is now available



CVRIA: A **FRAMEWORK** FOR INTEGRATING TECHNOLOGIES AND IDENTIFYING INTERFACES FOR STANDARDIZATION



Connected Vehicle Reference Implementation Architecture



<http://www.iteris.com/cvria/>

- The Systems Engineering Tool for Intelligent Transportation (SET-IT)

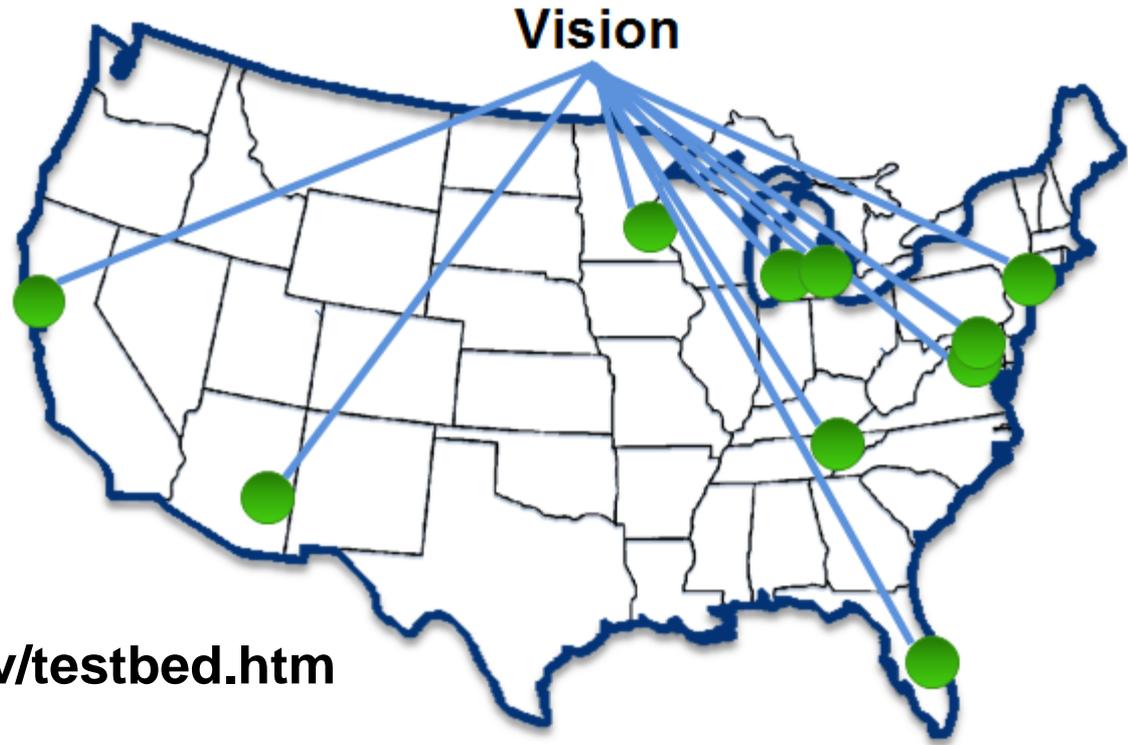


- Training in November and December



AFFILIATED CONNECTED VEHICLE TEST BEDS

- The vision is to have multiple interoperable locations as part of one connected system moving toward nation-wide deployment.
 - Common architecture
 - Common standards
 - Independent operations
 - Shared resources



<http://www.its.dot.gov/testbed.htm>





Stakeholder Q&A

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