Connected Vehicle Infrastructure to Support Safety, Mobility and Environmental Applications

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Research Towards Implementation

Drivers/Operators

Vehicles and Fleets

Connectivity

Infrastructure

Wireless Devices
Vehicle to Infrastructure Applications
V2I Safety Applications

- Accelerated Development
  - Red Light Violation Warning
  - Curve Speed Warning
  - Stop Sign Gap Assist

- Additional Applications Development
  - Stop Sign Violation
  - Railroad Crossing Violation Warning
  - Spot Weather Impact Warning
  - Oversize Vehicle Warning
  - Reduced Speed/Work Zone Warning
V2I Mobility Applications

Real-time Data Capture and Management

- Vehicle Status Data
- Weather Data
- Truck Data
- Transit Data
- Location Data
- Infrastructure Status Data

Dynamic Mobility Applications

- Multimodal Intelligent Traffic Signal System
- Intelligent Network Flow Optimization
- Advanced Integrated Corridor Management
- Response, Emergency Staging and Communications, Uniform Management, and Evacuation
- Enable Advanced Traveler Information Systems
- Intelligent Dynamic Transit Operations
- Road Weather Applications
- Freight Advanced Traveler Information Systems

U.S. Department of Transportation
V2I Environmental Applications

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

- Eco-Traveler Information
  - Dynamic Eco-Routing
  - Eco-Smart Parking
  - Multi-Modal Traveler Information

- Dynamic Eco-Lanes
  - Dynamic Eco-Lanes Management
  - Eco-Speed Harmonization
  - Eco-Cooperative Adaptive Cruise Control
  - Eco-Ramp Metering

- Dynamic Low Emissions Zones
  - Dynamic Emissions Pricing

- Support for Alternative Fuel Vehicle Operations
  - Alternative Fuel Vehicle (AFV) Charging / Fueling
Applications Research Approach

- Develop operational concepts
- Estimate potential benefits
- Prioritize applications
- Conduct Modeling and Analysis
- Conduct Field Trials and Model Deployments

- Federally funded research will provide open data and open sourced software for mobility applications
The Path to Deployment
NHTSA Agency Decision

- 2013 NHTSA agency decision on V2V and V2I safety communications systems. Options include:
  - Future regulatory action
  - Inclusion in the New Car Assessment Program (NCAP)
  - Further research and development

- Similar milestone in 2014 for a decision regarding V2V and V2I safety technology on heavy vehicles

- Information to support the decision will come from many sources, including the Safety Pilot Model Deployment
Safety Pilot Model Deployment

- 3,000 vehicles (cars, buses, and trucks) equipped with V2V devices.
- Provide data for determining the technologies’ effectiveness at reducing crashes.
- Includes vehicles with integrated safety applications and others that use aftermarket devices (i.e., not built into the vehicle)
- Applications to be tested include:
  - Blind Spot Warning/Lane Change Warning
  - Forward Collision Warning
  - Electronic Emergency Brake Lights
  - Intersection Movement Assist
  - Do Not Pass Warning
  - Control Loss Warning
Connected Vehicle Pooled Fund Study

- Established in 2009
- Currently involves 10 States, Maricopa County, AZ, Transport Canada – Virginia is lead State
- Purpose is to aid transportation agencies in justifying and promoting the deployment of cooperative transportation systems through modeling, development, engineering, and planning activities

[http://cts.virginia.edu/CTSPFS_1.html](http://cts.virginia.edu/CTSPFS_1.html)
INFRASTRUCTURE DEPLOYMENT PLANNING

- USDOT is working with state and local DOTs and private industry to plan for deployment
  - Standardized interfaces
    - Between vehicles
    - Between vehicles, roadside, and handheld devices
    - Between roadside equipment
    - Between roadside equipment and management centers
  - Certification processes for equipment and systems
  - Nationwide Security Credential Management System (SCMS)
  - National Cooperative Highway Research Program (2013 completion)
    - Benefit Cost Analysis for state and local DOTs, including funding options
    - DSRC deployment guidance for state DOTs
  - National Connected Vehicle Field Infrastructure Footprint Analysis (AASHTO led, 2014 completion)
National Connected Vehicle Field Infrastructure Footprint Analysis

- Comprehensive and detailed study including a set of design concepts with high level of engineering detail illustrating the relationships between applications & infrastructure
- Will define set of deployment scenarios
- Will answer:
  - Why is a Connected Vehicle field infrastructure needed?
  - What form should the field infrastructure take?
  - Where is deployment of field infrastructure needed?
  - By when should field infrastructure be in place?
  - What are the cost, organizational, and institutional implications of deploying, operating, and managing field infrastructure?
  - What are the planning and funding strategies to put the infrastructure into place in a coordinated manner?
National Connected Vehicle Field Infrastructure Footprint Analysis

- Will provide:
  - Preliminary national footprint of connected vehicle field infrastructure
  - Phased deployment plan, along with required actions and funding strategies
  - Cost estimates for deployment, operations, and maintenance.
  - Estimates of workforce and training requirements
  - Policy and guidance needs.
  - Identification of implementation challenges and required timeline for resolution
Exploration of Policy Issues Underway

- System security
- Privacy
- Governance
- Business Models
- Legal Issues
Summary

- Infrastructure based safety, mobility and environmental applications are under development
- 2013 is a key decision milestone for vehicle equipage, which will significantly impact infrastructure deployment
- Key deployment decisions have yet to be made
- USDOT, state and local DOTs, and private industry are working together to make these decisions and move from research concepts to deployment
Thank you!

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