Connected Vehicles for Safety

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The Problem

Safety
- 32,788 highway deaths in 2010
- 6,000,000 crashes/year
- Leading cause of death for ages 4 to 34

Mobility
- 4,200,000,000 hours of travel delay
- $80,000,000,000 cost of urban congestion

Environment
- 2,900,000,000 gallons of wasted fuel
ITS Research = Multimodal and Connected

Drivers/Operators

Connectivity

Vehicles and Fleets

Wireless Devices

Infrastructure
What is the Connected Vehicle Program

- Vehicle-to-vehicle and vehicle-to-infrastructure wireless communications for:
  - Crash prevention
  - Improved mobility
  - Environmental sustainability
- Over 80% of unimpaired crash scenarios addressed by connected vehicle capability
- Encompasses autos, buses, and trucks
  - Partnership among RITA, NHTSA, FHWA, FMCSA, and FTA
- Uses wireless communications
  - Dedicated Short-Range Communications (DSRC) technology using FCC-dedicated spectrum that is essential for safety applications
  - Other communications types for non-safety applications
- Research is maturing such that NHTSA has committed to an agency decision regarding whether the safety technology is sufficiently developed to support rulemaking
The Connected Vehicle Environment

- Uses wireless communications
  - Dedicated Short-Range Communications (DSRC) technology using FCC-dedicated spectrum that is essential for safety applications
  - Other communications types for non-safety applications
Key Program Objectives

- 2013 Decision on Vehicle Communications for Safety (light vehicles)
- 2014 Decision on Vehicle Communications for Safety (heavy vehicles)
- 2015 Infrastructure Implementation Guidance
**NHTSA Agency Decision**

- Possible decision options include:
  - **Rulemaking** on minimum performance requirements for vehicle communications for safety on new vehicles
  - Inclusion in NHTSA’s **New Car Assessment Program** to give car makers credit for voluntary inclusion of safety capability in new vehicles
  - **More research** required

- Data will determine NHTSA’s action for the 2013 decision point:
  - Simulation and modeling efforts based upon previous field operational tests
  - Data collection from vehicle-to-vehicle test track testing
  - Empirical data obtained from **Safety Pilot**
    - Driver clinics (user acceptance)
    - Model deployment activities (safety effectiveness)

- A key factor for the NHTSA decision will be the need for, and timing of, necessary infrastructure for communication security (still undefined)
2013 & 2014 Decisions → Based on Data!

- **Vehicle-to-Vehicle Research**
  - Interoperability among all vehicles
  - Evaluation of advanced applications
  - DVI effectiveness/acceptance
  - Benefits assessment

- **Safety Pilot**
  - User acceptance
  - Benefits data
  - Accelerate in-vehicle safety technology

- **Policy Elements**
  - Communications security
  - Device certification
  - Governance
  - Risk, liability, and intellectual property

- **Human Factors Research**
  - Driver-vehicle interface guidelines
  - Applies to integrated systems and to be extended to nomadic devices

- **Defined over-the-air interface standards**
  - Data, communications, performance
Safety Pilot Objectives

- Generate empirical data for supporting 2013 & 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
- 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
Safety Pilot Sites

- Driver clinics
  - Assess user acceptance

- Large-scale model deployment
  - Obtain empirical safety data for estimating safety benefits
User Acceptance - Driver Clinics

- 6 locations across the US beginning in August 2011
- 100 drivers per locations
- Experience Crash Warnings
  - Forward Crash Warning
  - Emergency Brake Light
  - Blind Spot Warning
  - Lane Change Warning
  - Intersection Assist
  - Do Not Pass Warning
Model Deployment

• Major road test and real world implementation taking place 2011 thru 2013, involving:
  • Approximately 3000 vehicles
  • Multiple vehicle types
  • Fully integrated systems and aftermarket devices
  • Roadside infrastructure
  • System wide interoperability testing
• Also to test
  • Prototype security mechanisms
  • Device certification processes

Integrated Vehicles
Integrated Trucks
Aftermarket Devices
Here I Am Vehicles
Roadside Infrastructure
Basic Communication Devices

- Devices that only transmit Basic Safety Message
  - No driver interface
- Initial procurement resulted in 8 awards
  - 6 vendors made it to acceptance testing
  - No vendors fully complied with the tests
  - Specification was considered by DOT as still weak
  - Updated specification and issued 2nd procurement
- 2nd procurement resulted in 4 awards
  - Currently underway
- Qualified Products List (QPL) estimated to be established later this year
Aftermarket Safety Devices

- Devices that transmit and receive Basic Safety Message
  - Driver interface for safety warnings
  - No integration with vehicle
- 4 vendors currently underway
- Applications include:
  - CICAS-V (red light warning) (V2I)
  - Curve overspeed warning (V2I)
  - Emergency electronic brake light (V2V)
  - Forward collision warning (V2V)
- QPL projected for March 2012

**Safety devices must comply with NHTSA driver interface criteria before being released to drivers for model deployment**
Roadside Equipment for Safety

- Transmission and receipt of V2I messages
  - Interfaces with signal controller (at intersections)
  - Supports other dangerous road segment applications
- Applications supported
  - CICAS-V (red light warning)
  - Curve overspeed warning
  - Collection of probe data transmissions
  - Other (tbd)
- 4 vendors currently underway
- QPL projected for January 2012
Privacy

- **A key concern from program beginning!**
  - Privacy principles and policy framework developed with privacy experts, interest groups and primary program stakeholders early in program
  - Addresses collection, storage and use of personal information
  - Consistent with Fair Information Practices Principles used in federal government
  - Basis for program decision-making and architecture development
  - Continuing to engage privacy experts and interest groups in review of program architecture and plans throughout
V2V and V2I Test Beds

Multiple Locations...
-One Connected System-

“In the street – running”
Mobility Program

Real-time Data Capture and Management

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

Mobility Applications

- Reduce Speed 35 MPH
- Transit Signal Priority
- Weather Application
- Real-Time Travel Info
- Fleet Management/Dynamic Route Guidance
- Signal Phase & Timing Adjusts Real-Time Conditions
- Safety Alerts and Warnings
Connected Transportation
For More Information

www.its.dot.gov