Connected Vehicle Update

ITS Committee Meeting

January 25, 2012

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Joint Program Office, RITA, U.S. DOT
## ITS Research Program Components

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<th>Applications</th>
<th>Safety</th>
<th>Mobility</th>
<th>Environment</th>
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<td>Real Time Data Capture &amp; Management</td>
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<td>Road Weather Applications</td>
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### Technology
- Harmonization of International Standards & Architecture
- Human Factors
- Systems Engineering
- Certification
- Test Environments

### Policy
- Deployment Scenarios
- Financing & Investment Models
- Operations & Governance
- Institutional Issues
Major Milestones

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<th>PROGRAM AREA</th>
<th>FOUNDATIONAL ANALYSIS</th>
<th>RESEARCH, DEVELOPMENT &amp; TESTING</th>
<th>PILOT IMPLEMENTATIONS</th>
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- Safety Workshop
- V to V Apps
- Qualified Product Lists (QPLs)
- Initial V to I Apps
- V2I Apps Defined
- Mobility and Environment Workshop
- High-Priority Mobility Apps Announced
- Apps Develop
- Revised Architecture Released
- Prototype Security Process
- Testbed Launch
- High-Priority AERIS Applications Selected
- Prototype Certification Process
- Prototype Governance Structure
- Mobility Benefits
- AERIS Benefit
- NHTSA Agency Decisions
- LV
- HT
- Regional Pilots
## Major Milestones

### Safety V2V
- Safety Workshop
- V to V Apps Defined
- Safety Benefits Assessment Completed

### Safety Pilot
- Initial V to I Apps
- Aftermarket V to I Apps
- Safety Pilot

### Safety V2I
- Revised Architecture Released
- Upgraded Testbed Launch

### Data Capture
- Data Environments
- Mobility Benefits

### Dynamic Mobility Apps.
- High-Priority Mobility Apps Announced
- Apps Develop

### Testbed
- Testbed Launch
- Revised Architecture Released

### Sys. Eng.
- Prototype Certification Process
- Prototype Governance Structure

### Standards
- High-Priority AERIS Applications Selected
- AERIS Benefit

### AERIS
- High-Priority AERIS Applications Selected
- AERIS Benefit

### Policy
- Prototype Certification Process
- Prototype Governance Structure

### Governance
- Prototype Certification Process
- Prototype Governance Structure

### NHTSA Agency Decisions
- LV
- HT

### Regional Pilots

### Program Area

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Overview

- Safety Pilot
- Policy
- V2I Safety
- Data Capture and Management
- Dynamic Mobility Applications
- AERIS
Safety Pilot Objectives

- Generate empirical data for supporting 2013 and 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
Safety Pilot Objectives (cont)

- 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
Vehicle Awareness Device

Antenna

Aftermarket Safety Device with Data Acquisition System (DAS)

DAS sensors, OEM can bus

Data Acquisition System (DAS)

Aftermarket Safety Device

Driver display

Data Acquisition from:
- Aftermarket device
- Radar or ranging device(s)
- 4 cameras, microphone
- OEM CAN bus data
- Vehicle motion
- Cell & GPS antennas
Commercial Vehicle Fleets
(3 Integrated Trucks, 16 Retrofits, ~50 VADs)

Con-way Freight
- Less-than-truckload carrier (daytime pickup/delivery, nighttime line-haul)
- UMTRI/DOT partner in past projects

Sysco Detroit LLC
- Food-service products for restaurants, schools, etc.
- Mix of tractors, trailers
Transit Vehicle Fleets
(3 Integrated Buses, ~100 Vehicle Awareness Devices)

Ann Arbor Transit Authority
- Operates 67 buses
- Active in national programs

University of Michigan
- Operates 61 buses
- Model deployment area spans two separate campuses with high bus traffic between and within.
Policy Research Focus

- Determine if V2V is feasible to implement
  - Security Needs
    - Functional Requirements
    - Physical/Technical Requirements
    - Operational & Organizational Requirements
    - Financial Sustainability and Responsibility
Policy - Security Network

The V2V/V2I system requires communications media for two critical purposes:

- Secure communications for distribution of certificates and revocation lists to make sure that entities on the system are legitimate users
- Trusted communications for delivering safety application data and messages (and, potentially, other applications and services)
Critical Questions

▪ Which communications media can support the needs for distributing security certificates? Choices include:
  □ Existing Cellular Networks
  □ Dedicated Short Range Communications (DSRC)
  □ WiFi
  □ Vehicle-Based Security Option

▪ What are advantages and limitations of each?

▪ How should the organizational functions of security certificate distribution and management be structured?
  □ Who should be responsible for them and how should they be funded initially and over time?
Communications Network Options and Analysis to Date

Analyze Data Delivery (Network) Options:
Requirements Definition: Fall 2011
Communications Options Analysis: Winter 2011/12
Business Models Analysis: Spring/Summer 2012
Supportable Operationally – Certificate Management

- Develop Certificate Management Organizational/Operational Models:
  - Roles and responsibilities
  - Organizational models

- Project Schedule:
  - Options due in winter 2011
  - Public meeting in April 2011 (for organizational analysis and network options – interim analysis for both projects)
  - Prototype testing: June 2012
  - Test Results and Evaluation of Approach: Jan 2013
  - Final Report: July 2013
Supportable Operationally – Financial Models

- All security network options require financing for operational support
  - All public – politically feasible?
  - Public/private partnership – what type of framework?
  - All private – where’s the value?
    - Data
    - Transactions
    - Spectrum
    - Other
V2I Safety

- Enabling Technologies – Working Towards an Integrated V2I Prototype
  - Signal Phase and Timing
  - Positioning
  - Communications
  - Mapping
  - End of 2012

- Applications
  - Broad Concept of Operations
  - Transit Applications
  - Smart Roadside
  - Working towards launching application development in 2012
Data Capture and Management: Near-term Data Products

- Saxton Lab (Virginia) Real-Time Data Feed
- V2V/V2I Test Bed (MI) Archived, Simulated and Real-Time Data Feed
- Weather IMO
- Test Data Sets
- World Congress Demo
- Related Demonstration Data
- DMA Application Data/Other Tests
- PDE/RDE
Data Capture and Management – Key Issue

- Assessment of Data Elements in the SAE J2735 - Basic Safety Message
  - What can we do with the Data if delivered only via DSRC (Density of roadside locations to be effective)?
  - What can we do if the data is delivered via other communication media?
  - Are there other critical data elements?
- Do we need to modify the SAE J2735 Probe Data Message Process and do we need to develop a performance criteria standard?
Dynamic Mobility Applications

- 6 Mobility Bundles Selected
- Contracts awarded to develop Concepts of Operations
- Stakeholder Workshops to Gather User Needs in progress
  - EnableATIS – held Dec 8, 2011
  - FRATIS – held Nov 3, 17, 29 and Dec 3, 2011
  - INFLO – to be held February 8, 2012, in Washington DC
  - IDTO – to be held January 26-27, 2012, in Washington DC
  - R.E.S.C.U.M.E. – TBD
  - M-ISIG – TBD
- Mobility Stakeholder Workshop being planned for ITSA Annual Meeting May 2012 in Washington DC
Identified Transformative Apps - Eco-Signals, Eco-Lanes, Low Emissions Zones, Support for Alternative Fuel Vehicle operations, Eco-Traveler Information, and Eco-ICM

Coordinated Nationally and Internationally - Held six webinars (Intro to AERIS, two on State of the Practice Reports, and three on the BAA research results), US/EU Sustainability Working Group (Vienna, Orlando), Japan METI and MLIT

Developed detailed outlines for each of the transformative Concepts in preparation for development of ConOps for each

Planning a public workshop March 14-15 in Washington, DC to further discuss data and other requirements for the TCs
  - Registration information and draft agenda to be developed and circulated soon.
Coming Soon / What Should I Do

- Review the Recently Released Connected Vehicle System Architecture
- Qualified Products Lists for
  - Vehicle Awareness Devices
  - Aftermarket Safety Devices
  - Roadside Equipment
    - Consider Buying Some, Get Engaged, Do Some Research
    - USDOT to post Mobility Research Questions soon
    - Considering additional Challenges using equipment and data
- Stakeholder Input Sessions
  - Safety - August
  - Dynamic Mobility Applications - May
  - AERIS - March
  - Policy - April
    - Attend, Contribute, Lead
- Updated Connected Vehicle Testbed coming soon
For More Information

www.ITS.DOT.GOV

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