USDOT Connected Vehicle Activities
Vehicle to Infrastructure Workshop

FHWA 2015 V2I Deployment Guidance

Graphic Source: USDOT
Welcome

• Robert Arnold
  Federal Highway Administration
  Director, Office of Transportation Management

• Jeffrey Lindley
  Federal Highway Administration
  Associate Administrator Office of Operations
The Path To Deployment

- Defined Safety (V2I), Mobility (V2V & V2I), AERIS and Weather Apps
- Pilots/Early Deployments
- Application Development
- NHTSA Decision Light Vehicles
- 2014
- NHTSA Decision Heavy Vehicles
- 2015
- FHWA Deployment Guidelines
- 2016

Graphic Source: USDOT
FHWA’s Plans and Objectives
Guidance on Infrastructure Implementation

• Guidance - not regulation
• What and how to implement infrastructure and supporting systems
  – Guidelines
  – Best Practices
  – Toolkit
• Supporting high-priority applications
  – V2I safety applications (crash warnings at traffic signals, etc.)
  – Dynamic mobility
  – Road-weather
  – Environmental
• Based on DOT research and AASHTO analysis of infrastructure needs and deployment approaches
Structure of the meeting

- What’s Happening?
- What are your needs?
  - Planning
  - Design and Integration
  - Institutional and Legal
  - Implementation
  - Operations
  - Transit/Multi-Modal
- How do you stay engaged?
How do you stay engaged?
What is Happening?

• Ben McKeever and Deborah Curtis, Federal Highway Administration, Turner-Fairbank Highway Research Center
AASHTO Footprint Analysis

• In 2012 USDOT requested AASHTO to form a team to conduct a national connected vehicle field infrastructure footprint analysis
  – Consider broad range of CV apps and scenarios
  – Include safety, mobility and environmental apps
  – Include light vehicles, transit, commercial vehicle and pedestrian apps
  – Include urban, rural, freeway, arterial, and freight/intermodal facilities, and land border crossings
• Task awarded and initiated in November 2012
Footprint Work Plan

Completed Tasks
• Develop a Tech Memo to initiate engagement with State and local agencies (Task 3)
• Assess the range of CV applications to identify deployment bundles (Task 4)
• Develop deployment concepts (Task 5)

Tasks Underway
• Develop deployment scenarios, a preliminary national footprint and cost estimates (Task 6) – Feb 2014
• Develop a Final Report (Task 7) – March 2014
80% of traffic signals are V2I connected with DSRC
25,000 other local safety V2I connected devices
Accurate real-time localized information on 90+% of roadway miles*
Next-generation, multimodal, information-driven active traffic management deployed system-wide*

*enabled by both cellular and DSRC communications
Estimated Deployment Timeline

- **Policy and Regulation**
  - FCC Spectrum Decision
  - National Deploy. Plan
  - NHTSA Heavy V2V Decision
  - FHWA Deploy. Guide

- **Infrastructure**
  - AASHTO Footprint Analysis
  - 1st DSRC on signals
  - DSRC on 20% of signals
  - DSRC on 80+% of signals

- **Vehicles**
  - Embedded cellular in many new vehicles
  - 1st DSRC in light vehicles (MY2020)
  - Embedded cellular in most vehicles
  - DSRC in 90+% of light vehicles

*Graphic Source: AASHTO*
PFS States → Likely Early Deployments
V2I Safety Applications

Curve Speed Warning

Red Light Violation Warning

Smart Roadside

Stop Sign Gap Assist

Driver Vehicle Interface (DVI) Example

Driver Infrastructure Interface (DII) (dynamic signal)

Driver Vehicle Interface (DVI) Example (static alert message)

Driver Vehicle Interface (DVI) Example

Graphcis/Image Source: USDOT
V2I Mobility Applications

MMITSS:
Multimodal Intelligent Traffic Signal System
Ben McKeever

INFLO:
Intelligent Network Flow Optimization
Mohammed Yousuf

R.E.S.C.U.M.E.:
Response, Emergency Staging and Communications,
Uniform Management, and Evacuation
Linda Dodge

Enable ATIS:
Enable Advanced Traveler Information Systems
Bob Rupert

IDTO:
Intelligent Dynamic Transit Operations
Ron Boenau

FRATIS:
Freight Advanced Traveler Information Systems
Randy Butler

Other Programs: ICM ATDM

Weather

Graphics Source: USDOT
• Specification 3.0 (prototype unit) is available
  – Used for Safety Pilot

• Specification 4.0 underway (pre-production unit) based on lessons learned – due in Summer 2014
  – Purpose of Update: to improve performance reliability, strengthen security protocols and promote common configurations and user interfaces across different vendors
  – Key changes
Signal Phase and Timing Application

• SPaT tested in Safety Pilot:
  – 6 intersections
  – Transit application
  – SPaT data

• Deploying in Affiliated Test Beds to support testing of Multi-Modal Intelligent Traffic Signal System (MMITSS) applications

• ConOps, Interface Control documents, and System Requirements available now – ask Deborah.Curtis@dot.gov
What’s Happening?

Jeffrey Spencer, Federal Transit Administration
TRP Retrofit and Applications

Right-Turn-In-Front Crash (V2V)

Pedestrian vs. Turning Bus Crash (V2I)

Images Source: USDOT

Graphics Source: Noblis
Data Environments and Mobility Bundles

**LEGEND**
- DMA PROGRAM FUNDED
- DMA SUPPORTED (NOT FUNDED), OPEN TO OTHER PROGRAMS AND RESEARCHERS

90+ ideas → 30 applications → 7 bundles

Graphic Source: Noblis
AERIS Transformative Concepts

- Eco-Signal Operations
- Dynamic Eco-Lanes
- Dynamic Low Emissions Zones
- Eco-Traveler Information
- Support for Alternative Fuel Vehicle (AFV) Operations

Graphics Source: Noblis
Enabling Technologies and Policy

- Architecture and Standards
- Security, Certification, Spectrum
- Data Environments
CVRIA

http://www.iteris.com/cvria/index.html

http://www.pcb.its.dot.gov/t3_archives.aspx
Next Step for CVRIA

• WORKSHOP:
  – February 19-20, 2014
  – San Francisco, CA

• FOCUS: Proposing candidate Connected Vehicle (CV) interfaces for standardization

• Registration Announcement to be issued soon by ITS JPO. Registration through ITS America.
Main Operations:

1. Device Initialization
2. Certificate Provisioning
3. Misbehavior Detection and Revocation

Security Credential Management System (SCMS)
- Issue and renewal of certificates
- Revocation of certificates

Communication channel(s) to SCMS

SCMS Manager
Certificate Processing
Misbehavior Detection and Revocation
Device Interface

Device
DSRC channel
Policy Research

• Key research is ongoing in the areas of:
  – Security
  – Certification
  – Spectrum
Data Environment Policies

Managing Multi-Source Data

- Research Data Exchange
  - [www.ITS-RDE.net](http://www.ITS-RDE.net)
  - Leesburg Vehicle Awareness Devices
  - Pasadena network data
  - Multiple Other Sources
  - Safety Pilot – Coming Soon
- High quality, well documented data

*Image Source: USDOT*
DEPLOYMENT IS NO LONGER JUST A CONCEPT!

• First generation vehicle and roadside technologies have been tested and are nearing completion
• Applications are being prototyped with planned testing in the near future
• Core and enabling technologies are emerging
• Initial timelines and deployment paths are emerging

Graphic Source: USDOT
Instructions for Break-Out Sessions

• Planning – Executive Room
• Design and Integration – Senate Room
• Institutional and Legal – Capitol Room
• Implementation – Embassy Room
• Operations – Calvert Room
• Transit/Multi-Modal – Stay in Hampton Room
Next Steps

• Develop a summary of today’s meeting
  – Needs and priorities for FHWA guidance
  – Gaps/Open Questions

• Use input for analysis into FHWA process and decisions

• Continue to engage with stakeholders
  – Future thoughts after this meeting
  – Comments on materials / clarifications on topics
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