Connected Vehicle Policy:

Support to Implementation

November 13, 2013
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Presentation Overview

- Policy Process:
  - Modal Collaboration and Partnership
  - Policy Framework
- Policy Initiatives:
  - Transit Applications
  - Infrastructure
  - Data Capture and Management
  - Mobility / AERIS / Road Weather
  - Security
  - Deployment Path Forward
- Stay Connected
The ITS JPO works with modal partners in implementing the strategic vision and to research policy issues collaboratively.
## Connected Vehicle Research Program

### Applications
- **Safety**
  - V2V
  - V2I
  - Safety Pilot
- **Mobility**
  - Real Time Data Capture & Management
  - Dynamic Mobility Applications
- **Environment**
  - AERIS
  - Road Weather Applications

### Technology
- Harmonization of International Standards & Architecture
- Human Factors
- Systems Engineering
- Certification
- Test Environments

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

*Deliberative - Internal DOT Only*

Image Source: Thinkstock/USDOT

U.S. Department of Transportation
Research and Innovative Technology Administration
Policy Program Organizational Structure

- ITS Management Council
- DOT Leadership

V2V / Senior Policy Task Force

Implementation Policy Research & Analysis
- Financial/Partnership Models
- Security Policy – Certificate Management Entities
- Cost-Benefit Analysis
- Governance/Oversight Models
- Implementation Strategies

Technical Policy Research & Analysis
- Communications Media Analysis
- Infrastructure Analysis
- Core System Policies
- Interface Policy Framework
- Standards/Harmonization Policy
- Certification Policy
- Spectrum Policy

Legal Policy Research & Analysis
- U.S. DOT Authority
- Privacy
- Liability/Risk Sharing
- Intellectual Property
- Data ownership/access
- Antitrust & Spectrum

• Deliberative - Internal DOT Only
Three Key Stages in Policy Analysis

1. Issues Identification
   - Review of Technical Decisions
   - Highly Iterative Stage

2. Options Development, Comparative Analysis, Stakeholder Validation
   - Maturing of the Technical Design and Options
   - Development of Policy Options
   - Advantages/Disadvantages Analysis

3. Policy Decisions and Implementation
   - Societal Cost-Benefit Analysis / Business Models
   - Implementation Planning
When we say “Policy”… Issue Areas Include

- Certification ……………………what certification is required?
- Communications ……………… which technologies are preferred?
- Credentialing …………………… who has access to CV systems?
- Data governance ………………… who may access the data?
- Governance …………………… what are the roles of the participants?
- Intellectual Property ………… what are the risks for exposure?
- Interoperability ………………… how is data exchange handled?
- Liability ……………………… who is responsible for bad outcomes?
- Privacy ……………………… what information to protect?
- Resiliency ……………………… what are the failure modes?
- Security ……………………… how to we prevent inappropriate usage?
- Social equity …………………… how are benefits distributed?
Transit Applications in CVRIA

- **Transit Mobility**
  - Dynamic Ridesharing
  - Dynamic Transit Operations
  - Integrated Multi-Modal Electronic Payment
  - Intermittent Bus Lanes
  - Route ID for the Visually Impaired
  - Smart Park and Ride System
  - Transit Connection Protection
  - Transit Stop Request

- **Transit Safety**
  - Transit Pedestrian Indication
  - Transit Vehicle at Station/Stop Warnings
  - Vehicle Turning Right in Front of a Transit Vehicle
Connected Vehicle Reference Implementation Architecture (CVRIA)

• **Connected Vehicle Reference Implementation Architecture (CVRIA):**
  • Identify a framework for integrating connected vehicle technologies and identify interfaces for standardization

• **Key Outcomes:**
  • An initial Connected Vehicle Architecture that can be integrated into the National ITS Architecture
  • Identification of key interfaces of a connected vehicle environment
  • A Connected Vehicle Standards Development Plan
  • Policy analysis

• **Process:**
  • Collecting and aggregating connected vehicle needs
  • Developing a multi-faceted architecture
  • Identifying and prioritizing candidate interfaces for standardization
  • Supporting policy analysis
  • On-going dialogue with stakeholder community
What does an Architecture View Look Like?

For each application:

- Identify information flows
  - Primarily from physical view
  - Some enterprise

- Look for policy issues
WE NEED FEEDBACK!!!

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

TRANSIT CVRIA WEBINAR:
DECEMBER 10 2013
2pm-4pm EDT

Register at: http://www.pcb.its.dot.gov/webinars_cvria.aspx
# Transit Applications: Policy Issues

<table>
<thead>
<tr>
<th>Application Specific Issues</th>
<th>Universal Issues</th>
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<tbody>
<tr>
<td><strong>Governance</strong></td>
<td><strong>Interoperability</strong> among roadside equipment (RSE), onboard equipment (OBE) and personal information devices (PID)</td>
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<tr>
<td>□ Business rules for deciding when to protect a connection</td>
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<td>□ Agreements for multiple transit service providers to cooperate in a single application</td>
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<tr>
<td>□ Regulation of dynamic ridesharing: unlicensed cab company? Safety of drivers and passengers?</td>
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<tr>
<td><strong>Security</strong></td>
<td><strong>Communications</strong></td>
</tr>
<tr>
<td>□ Avoid self-interested hacking (e.g., an unauthorized signal to hold a bus because you are late)</td>
<td>□ When is DSRC really needed?</td>
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<tr>
<td>□ Protect financial information (for multi-modal payment)</td>
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<tr>
<td><strong>Liability</strong></td>
<td><strong>Security</strong> of links between external data sources (Maps and RSE) and vehicle OBE; security of links to/from RSE and PID</td>
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<tr>
<td>□ Safety application causes a crash</td>
<td></td>
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<tr>
<td>□ Vehicle operator distraction</td>
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<tr>
<td>□ Mobility application leaves a rider stranded, or adversely affects a transit provider’s operation</td>
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Infrastructure Policy

• FHWA Guidance on Infrastructure Implementation, 2015
  • Guidance - NOT a requirement to implement infrastructure.
  • Working with FTA to determine impacts of FHWA Policy and to determine FTA’s role in issuing Policy
    • May have additional authorities due to new Safety regulatory oversight requirements
How will we understand Infrastructure Policy Needs?

- **National Connected Vehicle Field Infrastructure Footprint Analysis**
  - AASHTO led, member involvement, 2014 completion
  - *Working with FTA to define a similar effort for transit needs*
- Preliminary, general concepts have been drafted to show how the system would look in “real world” settings, including:
  - Rural Freeways
  - Urban Highways and Intersections
  - Freight Facility
  - International Border Crossings
- Each setting will be examined for:
  - Current state, unique requirements
  - How best to use existing infrastructure for new equipment
  - Communication and management challenges
  - Applications that may be supported
  - Cost considerations
- Each setting will be rendered as a high-level engineering drawing
Infrastructure Deployment Planning

• Other research includes:
  • National Cooperative Highway Research Program (2013 completion)
    − Benefit Cost Analysis for state and local DOTs and transit age, including funding options
    − DSRC deployment guidance
    − Standardized interfaces
  • Certification processes for equipment and systems
  • Nationwide Security Credential Management System (SCMS)
Benefit Assessment

- Societal Benefits
  - Early Estimates for safety ~ $44 B\(^1\) over 40 years
  - NCHRP Study (03-101 B/C Analysis 2013) is nearing completion for state agencies:
    - Case studies for test bed costs in VA, MI, AZ
    - Brainstorm possible agency savings
    - Conduct rigorous B/C analysis including sensitivity analysis
  - Benefit Trends–2013 ~ Year 1 implementation

1. Volpe Center 2008 Cost-Benefit Analysis

Image Source: Thinkstock/USDOT
Data Environment Policies

• Managing Multi-Source Data

  • Research Data Exchange
    • www.ITS-RDE.net
    • Leesburg Vehicle Awareness Devices
    • Pasadena network data
    • Multiple Other Sources
    • Safety Pilot – Coming Soon

  • High quality, well documented data
Mobility, Weather, and AERIS – Policy Issues
Dynamic Mobility Applications Policy Research

Open Source Portal

OS Portal Manager:
The entity or community that manages the OS Portal

Associated Applications

LEGEND

DNA PROGRAM FUND
DNA SUPPORTED (NOT FUND), OPEN TO OTHER PROGRAMS AND RESEARCHERS

<table>
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<tr>
<th>Application</th>
<th>Contact</th>
</tr>
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<tbody>
<tr>
<td>MMITSS: Multimodal Intelligent Traffic Signal System</td>
<td>Ben McKeever</td>
</tr>
<tr>
<td>INFLO: Intelligent Network Flow Optimization</td>
<td>Mohammed Yousuf</td>
</tr>
<tr>
<td>Enable ATIS: Enable Advanced Traveler Information Systems</td>
<td>Bob Rupert</td>
</tr>
<tr>
<td>IDTO: Intelligent Dynamic Transit Operations</td>
<td>Ron Boenau</td>
</tr>
<tr>
<td>FRATIS: Freight Advanced Traveler Information Systems</td>
<td>Randy Butler</td>
</tr>
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Other Programs: ICM, ATDM, Weather

Image Source: Thinkstock/USDOT
V2V Security Communications

- DSRC channel
- Communication channel(s) to SCMS

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

Three types of communications
- Basic safety message broadcasts from vehicles
- Communication Channel from Vehicles to SCMS
  - Send misbehavior reports (messages flagged by local misbehavior detection)
- Communication Channel from SCMS to Vehicles
  - Issue New Certificates
  - Update Vehicles with Certificate Revocation List
High Level SCMS Technical Structure

- **Main Operations:**
  1. Device Initialization
  2. Certificate Provisioning
  3. Misbehavior Detection and Revocation
Moving Towards Infrastructure Deployment

- Defined Safety (V2I), Mobility (V2V & V2I), AERIS and Weather Apps
- Application Development
- NHTSA Decision Light Vehicles
- NHTSA Decision Heavy Vehicles
- FHWA / FTA Deployment Policy and/or Guidelines
- Pilots/Early Deployments
Upcoming Events

  - Right after TRB ends
  - Looking at the Shoreham Hotel
  - Federal Register Notice & details in ITS JPO NEWS coming soon

  - Workshop needs will translate into basis for policy options and guidance for implementation

- Build out of the Southeast Michigan Architecture, ITS World Congress 2014
  - Will act as a test site for interoperability
  - Vendors can bring products for “plug and play” testing
  - Weekly, Tuesday discussion calls as the build out occurs, 12:30pm-2:00pm EDT
    - *If interested, let me know and I’ll forward the calendar invite*
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