Intelligent Transportation Systems (ITS) Joint Program Office (JPO)

Connected Vehicle Reference Implementation Architecture Update

Stakeholder’s Webinar
November & December 2013
Transit Applications

**Mobility**
- Signals
  - (ECO) Transit Signal Priority
- Traveler Information
  - Advanced Traveler Information Systems
- Other Transit
  - 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

**Safety**
- Vehicle to Infrastructure (V2I) Safety for Transit.
  - Curve Speed Warning
  - **Pedestrian in Signalized Crosswalk Warning**
  - Transit Vehicle at Station/Stop Warnings
- Vehicle to Vehicle (V2V) Safety for Transit
  - Forward Collision Warning
  - Vehicle Turning Right in Front of a Transit Vehicle
Poll Question 1

Which of the following best describes your role in Connected Vehicles?

- Federal Government
- State DOT or Metropolitan Planning Organization
- Local government
- Car maker / OEM
- Roadside equipment maker
- Consultant
- Academic
- Other
Poll Question 2

- How familiar are you with CVRIA (check all that apply)?
  - Attended one of the previous webinars
  - Visited the CVRIA website
  - This is my first experience
CVRIA Update Webinars

- These webinars are meant to:
  - Familiarize attendees with the Connected Vehicle Reference Implementation Architecture (CVRIA) so that they will be equipped to provide feedback on the architecture
  - Provide an update on the development of the CVRIA
  - Review portions of the CVRIA Website
  - Discuss standardization planning and policy analysis

- Today’s Speakers
  - Jeff Spencer
  - David Binkley, Ron Ice, Tom Lusco
  - Chris Karaffa, Jim Marousek
  - Scott Smith
# CVRIA Update Webinar #6 – Agenda

<table>
<thead>
<tr>
<th>Topic</th>
<th>Start</th>
<th>End</th>
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</thead>
<tbody>
<tr>
<td>Welcome &amp; Background/Overview</td>
<td>2:00</td>
<td>2:10</td>
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<tr>
<td>Introduce Applications of the Day</td>
<td>2:10</td>
<td>2:20</td>
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<tr>
<td>CVRIA Applications</td>
<td>2:20</td>
<td>3:15</td>
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<tr>
<td>Interface Selection / Standardization Planning</td>
<td>3:15</td>
<td>3:30</td>
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<tr>
<td>Pertinent Policy Issues</td>
<td>3:30</td>
<td>3:45</td>
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<tr>
<td>Q&amp;A</td>
<td>3:45</td>
<td>4:00</td>
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</tbody>
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(All Times Eastern)
## CVRIA Update Webinar – Applications to be Reviewed

<table>
<thead>
<tr>
<th>Applications for Webinar</th>
<th>Date</th>
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<tbody>
<tr>
<td><strong>V2I</strong></td>
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<tr>
<td>• Red Light Violation Warning</td>
<td>Nov 6, 2013</td>
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<tr>
<td>• Curve Speed Warning</td>
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<tr>
<td>• Speed Harmonization (SPD-HARM)</td>
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<tr>
<td><strong>Signal Applications</strong></td>
<td>Nov 14</td>
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<tr>
<td>• Intelligent Traffic Signal System</td>
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<td>• Emergency Vehicle Priority</td>
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<td>• Eco-Approach and Departure</td>
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<tr>
<td><strong>Road Weather</strong></td>
<td>Nov 19</td>
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<tr>
<td>• Weather Responsive Traffic Management</td>
<td></td>
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<td>• Enhanced Maintenance Decision Support</td>
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</tbody>
</table>
## CVRIA Update Webinar – Applications to be Reviewed, continued

<table>
<thead>
<tr>
<th>Topics</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td><strong>Freight &amp; Fleet Operations</strong></td>
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<tr>
<td>• Smart Roadside Initiative</td>
<td></td>
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<tr>
<td>• Freight Advanced Traveler Information Systems (FRATIS)</td>
<td>Nov 26</td>
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<tr>
<td><strong>Support Applications</strong></td>
<td>Dec 3</td>
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<tr>
<td>• Data Distribution</td>
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<td>• Communications Support</td>
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<td>• Core Authorization</td>
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<tr>
<td><strong>Transit Applications</strong></td>
<td>Dec 10</td>
</tr>
<tr>
<td>• Pedestrian in Signalized Crosswalk Warning</td>
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<tr>
<td>• Integrated Multi-modal Payment</td>
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<tr>
<td><strong>R.E.S.C.U.M.E.</strong></td>
<td>Dec 17</td>
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<tr>
<td>• Incident Scene Pre-Arrival Staging Guidance for Emergency Responders</td>
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<tr>
<td>• Incident Scene Work Zone Alerts for Drivers &amp; Workers</td>
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(Dates/Times and Specific Topics Subject to Change)
Connected Vehicle Reference Implementation Architecture (CVRIA)

Landscape: Safety, Mobility, Environmental Applications with common supporting infrastructure

- Purpose of CVRIA is to identify a framework for integrating connected vehicle technologies and identify interfaces for standardization
- By...
  - Collecting and aggregating connected vehicle needs/requirements
  - Developing a multi-faceted system architecture
  - Identifying and prioritizing candidate interfaces for standardization
  - Conducting policy analysis around the architecture
- Near term uses – Define interfaces/functions/standards to support early deployments, e.g. SE Michigan 2014
- Longer term – the National ITS Architecture will incorporate CVRIA to support use of connected vehicle in
  - regional ITS architectures/plans
  - future transportation projects
- So, we need your help:
  - Are we capturing the connected vehicle applications adequately?
  - Are we including all of the necessary interfaces?
  - We’ll show you how to provide feedback via the website?
Poll Question 3

- With what area of the connected vehicle program are you or your stakeholders primarily interested?
  - Safety
  - Mobility
  - Environment
  - Support
This site uses Scalable Vector Graphics (SVGs) to produce diagrams that are crisp and support hyperlinks from the graphical elements to the detailed descriptions

- Different web browsers support SVGs in different ways (some not at all). Try viewing the site with browsers like Firefox, Chrome, Safari for best results.
- As an alternative to SVGs all graphics are also available Portable Network Graphics (PNG) format. You may have to click on the PNG option to see it.

- This site is still under construction, many pages are updated on a fairly regular basis. Make sure you are looking at the latest version of a web page by clicking “Refresh” or “Reload” within your browser.
Web Tour Road Map

Start here

JPO / Stds / Activities / CVRIA

Start / Home www.iteris.com/cvria/

What’s the overall layout?

Architecture Viewpoints Tab

Let’s focus on an application

Applications Tab

How do I learn about an app?

Physical Tab (objects, flows, comm)

Enterprise Tab (4 phases)

How do I provide feedback?

Functional & Requirements Tabs

What about standards?

Standards Tab

Resources / Glossary

What else is here?

Comment on Page
Let’s Begin the Tour

Go To Website

http://www.standards.its.dot.gov/DevelopmentActivities/CVReference

Or

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

At conclusion of webtour Skip to Use of CVRIA Slides
Poll Question 4

Which of the Architecture Views presented interests you the most?
- Communications
- Enterprise
- Functional
- Physical
Uses of CVRIA

Now that you’ve completed the ‘tour’ of the website, let’s talk about some ways that CVRIA can be used...

### SE Michigan 2014
- Provide platform for interoperability between vendors, operators and solution providers by developing V2I data exchanges
  - Field and Back-Office functions
- Developing Architecture Views using CVRIA:
  - Physical (What)
    - Multi-layer diagrams
  - Enterprise (Who)
  - Communications

### Future Connected Vehicle Projects
- CVRIA ‘Mini-Tool’ allows developers to use the CVRIA Visio Drawings
- Customize physical view drawings to describe future projects using same ‘language’ and format
- Supports multi-layer approach
  - Layer 0 – high-level objects and interconnections
  - Layer 1 – project specific physical, application objects
  - Layer 2 – application level (just like the application drawings on CVRIA website)

Connected Vehicle projects can be defined as collections of applications from CVRIA and use the same ‘language’, interfaces, standards
CVRIA Next Steps

- **November / December**
  - Gathering feedback from webinars and website
  - Incorporate inputs
  - Update tools
- **Ongoing**
  - Maintain CVRIA
- **2014 / 2015**
  - Monitor usage in Test Beds, Demos, Early Deployments
    - Updating architecture, tools as needed
  - Merge / Incorporate CVRIA into Nat’l ITS Arch
Intelligent Transportation Systems (ITS)
Joint Program Office (JPO)

Connected Vehicle Reference Implementation
Architecture:

Standards Development Strategy and Plan
CVRIA and Standards

The USDOT’s Intelligent Transportation Systems (ITS) Joint Program Office (JPO) is developing a standards plan to guide ITS standards-related efforts and activities in support of the USDOT ITS connected vehicle research program, and to support broad deployment of connected vehicle (CV) technologies.

This plan will be a living document that will evolve as ITS technologies, implementation strategies, and policies develop.

The plan will help the USDOT bridge the “standards gap”

- **Adopt**
  - Lower effort, cost
  - Quicker implementation
  - Modify interface to meet the standard

- **Adapt**
  - Increased effort, cost
  - Extended implementation
  - Adapt standard to the extent possible, adapt interface as necessary

- **Create**
  - Greatest effort, cost
  - Longest implementation
  - Get it “just the way you like it”
Standards Plan Approach

Once interfaces are identified and defined, they must be prioritized and associated with standards, which will then be prioritized.

The CVRIA will identify and define interfaces within the connected vehicle environment (CVE).

Interfaces will be prioritized based on criteria established and validated prior to their identification.

Interfaces will then be evaluated against existing standards to identify gaps or inadequacies.

The standards prioritization will be applied to those gaps to develop the standards plan.
Using Prioritization

- Scoring process and criteria are not absolute

- They are one factor, among many, in determining how to allocate resources to support standardization activities

- They may be adapted to evolving goals and objectives
Next Steps

- **Currently**
  - The CVRIA viewpoints/database are being analyzed now to identify and define interfaces within the architecture.

- **Feedback**
  - Feedback on applications or other aspects of the architecture will help us to refine: *interface identification and definition; scoring; interpreting results.*

- **Second Public Workshop**
  - Presentation of findings and results of interface and standards prioritization
  - First opportunity to share results of the interface and standards analyses
  - Tentatively planned for the San Francisco Bay Area, February 19-20, 2014
Poll Question 5

- Are these views clear and stable enough to start interface analysis for standards?
  - Yes
  - No
  - Unsure
Intelligent Transportation Systems (ITS)
Joint Program Office (JPO)

Connected Vehicle Reference Implementation
Architecture

and

Connected Vehicle Policy

Scott Smith
USDOT / Research and Innovative Technology Administration / Volpe National Transportation Systems Center
December 2013
When we say “Policy”… Issue Areas Include (1/2)

- Certification……………………what certification is required?
- Communications………………….what technologies are preferred?
  - When is DSRC necessary or desirable?
- Credentialing……………………who has access to CV systems?
  - Who may have access to on-board or roadside equipment for maintenance. What training / certification is needed?
- Data governance………………….who may access the data?
  - Privacy (movement tracking) concerns
  - Use of data for enforcement
  - Use of data to establish liability
- Governance……………………what are the roles of the participants?
  - Who runs the various systems
  - How to avoid road user distraction (driver or pedestrian)
Policy Issue Areas (2/2)

- Intellectual Property.........what are the risks for exposure?
- Interoperability...............how is data exchange handled?
  - Between onboard, roadside, and personal DSRC equipment, which may come from a variety of manufacturers
- Liability........................who is responsible for bad outcomes?
- Privacy........................what information to protect?
- Resiliency......................what are the failure modes?
  - Dependence on reliable map and roadway geometry information
- Security.........................how to we prevent inappropriate usage?
  - OBE and external data sources (RSE, maps)
  - Security of links to RSE
- Social equity....................how are benefits distributed?
  - Safety/mobility impacts on non-connected vehicles
  - Safety/mobility impacts on other road users
Policy Process (1/2)

For each application:
- Identify information flows
  - Primarily from physical view
  - Some enterprise
- Look for policy issues
Policy Process (2/2)

- Write brief summaries of each issue
- One information flow may apply to multiple applications
# Pedestrian in Signalized Crosswalk Warning

<table>
<thead>
<tr>
<th>Application Specific Issues</th>
<th>Most Relevant Universal Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Certification and Interoperability</strong></td>
<td><strong>Communications</strong></td>
</tr>
<tr>
<td>- What requirements apply to personal information devices (PIDs)</td>
<td>- When is DSRC really needed?</td>
</tr>
<tr>
<td><strong>Communications</strong></td>
<td><strong>Data Governance</strong></td>
</tr>
<tr>
<td>- Size, weight and power constraints on PIDs</td>
<td>- Privacy (movement tracking)</td>
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<tr>
<td>- Do PIDs communicate with vehicle OBEs or only RSEs?</td>
<td>- Enforcement</td>
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<tr>
<td><strong>Social equity</strong></td>
<td>- Liability</td>
</tr>
<tr>
<td>- In CVRIA, “pedestrians” includes all non-motorized users, such as bicyclists and animal-drawn vehicles. What applications will improve safety for them?</td>
<td><strong>Interoperability</strong> between roadside equipment (RSE) and onboard equipment (OBE)</td>
</tr>
<tr>
<td>- What applications protect non-motorized road users, including pedestrians, who are not in signalized crosswalks?</td>
<td><strong>Privacy</strong> What information (e.g., driver PII) is considered highly sensitive?</td>
</tr>
<tr>
<td>- Will the applications protect pedestrians with visual or mobility impairments?</td>
<td><strong>Security</strong> of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE</td>
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<tr>
<td>- Affordability of PIDs</td>
<td><strong>Social Equity</strong></td>
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<td></td>
<td>- Safety and mobility impacts on non-connected vehicles</td>
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<td>- Safety and mobility impacts on other road users</td>
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</table>
Integrated Multi-modal Payment

**Focus here is on the electronic payment interfaces. Supporting interfaces between field equipment that support detection/record of payment violations not included.**
# Integrated Multimodal Fare Payment

## Application Specific Issues

- **Credentialing.** Employees with access to sensitive personal travel and financial information need to be properly screened and trained.

- **Data Governance**
  - Who owns the personal/financial information?

- **Governance**
  - Who will finance and run a multi-agency system?

- **Interoperability**
  - How much benefit from inter-agency interoperability?
  - Should specific fare media be encouraged for specific applications?

- **Resiliency**
  - Protection from hacking / theft
  - Policies for system and fare media failures

- **Security**
  - Meet financial industry standards for security of payment information

- **Social Equity**
  - Ensuring that smaller service providers (e.g., a small parking lot) have access to the system
  - Ensure that all have access to fare media

## Most Relevant Universal Issues

- **Communications**
  - When is DSRC really needed? (other frequency bands are currently being used)

- **Security** of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE

- **Data Governance**
  - Privacy (movement tracking)
  - Enforcement
  - Liability
Poll Question 6

- Do you plan to visit the CVRIA website and add comments by the end of December?
  - Yes
  - No
  - Unsure
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Joint Program Office (JPO)

Connected Vehicle Reference Implementation
Architecture Update

Q&A + Final Thoughts
This concludes today’s webinar.

Check out the T3 site and the CVRIA website (http://www.iteris.com/cvria/) for the next webinar or to view archives of previous webinars.

Keep those comments coming!
- CVRIAcomments@iteris.com

For other questions on CVRIA or the connected vehicle program:
- Steve.Sill@dot.gov  – 202-366-1603
- Walt.Fehr@dot.gov  – 202-366-0278