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

Connected Vehicle Reference Implementation Architecture Update

Stakeholder’s Webinar
November & December 2013
Response, Emergency Staging and Communications, Uniform Management, and Evacuation

- Incident Scene Pre-Arrival Staging Guidance for Emergency Responders (RESP-STG)

- Incident Scene Work Zone Alerts for Drivers and Workers (INC-ZONE)

- Emergency Communications and Evacuation (EVAC)
R.E.S.C.U.M.E. Program Status

Phase I (FY12-FY13)
- Completed ConOps, Systems Requirements Document, and Test Readiness Assessment

Phase II (FY13-FY14)
- Prototype Development and Testing
  - Develop and test prototypes for INC-ZONE and RESP-STG
  - Define an architecture for EVAC and identify institutional issues
  - Awarded to Battelle/UMD-CATT team; kickoff 8/28/2013
- Impacts Assessment
  - Estimate impacts of integrated multi-application deployments using standardized messages and shared communication networks
  - Awarded to Booz Allen; kickoff in mid-September
R.E.S.C.U.M.E. Program Status (cont’d)

Phase II Prototype Development Status

- Detailed Requirements for Prototype
  - Completed
- Prototype System Architecture
  - Under development now; final by January 2014
  - Your input today on the Phase I System Architecture will be welcome and valuable as we shape the Phase II Architecture
- Prototype System Design Document
  - Final due in January 2014
- Prototype System Acceptance Test Plan & Summary
  - Final due in February 2014
  - Testing and results due in March 2014
- Prototype Demonstrations
  - Go/No-Go decision based on test results.
  - If approved, expect demos in late FY14 / early FY15
For More Information

Linda Dodge
Chief of Staff & ITS Public Safety Program Manager
ITS JPO, USDOT
202.366.8034
linda.dodge@dot.gov

http://www.its.dot.gov/
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

- Linda Dodge
- David Binkley, Ron Ice, Tom Lusco
- Chris Karaffa, Jim Marousek
- Dawn LaFrance-Linden, Scott Smith
# CVRIA Update Webinar #7 – Agenda

<table>
<thead>
<tr>
<th>Topic</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welcome &amp; Background/Overview</td>
<td>1:30</td>
<td>1:40</td>
</tr>
<tr>
<td>Introduce Applications of the Day</td>
<td>1:40</td>
<td>1:50</td>
</tr>
<tr>
<td>CVRIA Applications</td>
<td>1:50</td>
<td>2:45</td>
</tr>
<tr>
<td>Interface Selection / Standardization Planning</td>
<td>2:45</td>
<td>3:00</td>
</tr>
<tr>
<td>Pertinent Policy Issues</td>
<td>3:00</td>
<td>3:15</td>
</tr>
<tr>
<td>Q&amp;A</td>
<td>3:15</td>
<td>3:30</td>
</tr>
</tbody>
</table>

(All Times Eastern)
## CVRIA Update Webinar – Applications to be Reviewed

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

<table>
<thead>
<tr>
<th>Topics</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Freight &amp; Fleet Operations</strong></td>
<td>Nov 26</td>
</tr>
<tr>
<td>• Smart Roadside Initiative</td>
<td></td>
</tr>
<tr>
<td>• Freight Advanced Traveler Information Systems (FRATIS)</td>
<td></td>
</tr>
<tr>
<td><strong>Support Applications</strong></td>
<td>Dec 3</td>
</tr>
<tr>
<td>• Data Distribution</td>
<td></td>
</tr>
<tr>
<td>• Communications Support</td>
<td></td>
</tr>
<tr>
<td>• Core Authorization</td>
<td></td>
</tr>
<tr>
<td><strong>Transit Applications</strong></td>
<td>Dec 10</td>
</tr>
<tr>
<td>• Pedestrian in Signalized Crosswalk Warning</td>
<td></td>
</tr>
<tr>
<td>• Integrated Multi-modal Payment</td>
<td></td>
</tr>
<tr>
<td><strong>R.E.S.C.U.M.E.</strong></td>
<td>Dec 17</td>
</tr>
<tr>
<td>• Incident Scene Pre-Arrival Staging Guidance for Emergency Responders</td>
<td></td>
</tr>
<tr>
<td>• Incident Scene Work Zone Alerts for Drivers &amp; Workers</td>
<td></td>
</tr>
</tbody>
</table>
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.
Let’s focus on an application

How do I learn about an app?

Physical Tab (objects, flows, comm)

Enterprise Tab (4 phases)

Functional & Requirements Tabs

What about standards?

Standards Tab

How do I provide feedback?

Resources / Glossary

Comment on Page

What’s the overall layout?

Architecture Viewpoints Tab

Start here

JPO / Stds / Activities / CVRIA

Start / Home www.iteris.com/cvria/
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...

<table>
<thead>
<tr>
<th>SE Michigan 2014</th>
<th>Future Connected Vehicle Projects</th>
</tr>
</thead>
</table>
| ▪ Provide platform for interoperability between vendors, operators and solution providers by developing V2I data exchanges  
  □ Field and Back-Office functions | ▪ CVRIA ‘Mini-Tool’ allows developers to use the CVRIA Visio Drawings  
 | ▪ Developing Architecture Views using CVRIA: | ▪ Customize physical view drawings to describe future projects using same ‘language’ and format  
  □ Physical (What)  
    ▪ Multi-layer diagrams  
  □ Enterprise (Who)  
  □ Communications  | ▪ 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
Incident Scene Pre-Arrival Staging Guidance for Emergency Responders
Policy Process (1/2)

For each application:

- Identify information flows
  - Primarily from physical view
  - Some enterprise
- Look for policy issues

For each application:
Policy Process (2/2)

- Write brief summaries of each issue
- One information flow may apply to multiple applications

<table>
<thead>
<tr>
<th>From (flow origin)</th>
<th>To (flow destination)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal Information Device</td>
<td>Personal Information Device</td>
</tr>
<tr>
<td>Roadside Equipment</td>
<td>Pedestrians</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spreads</th>
<th>Policy Area</th>
<th>Issue Title</th>
<th>Issue Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>A031</td>
<td>143 Governance</td>
<td>Prevailing Data Source</td>
<td>In cases where two or more sources provide location or other critical data, which source is deemed the most accurate?</td>
</tr>
<tr>
<td>A033</td>
<td>144 Governance</td>
<td>Pedestrian Traffic Laws</td>
<td>Is pedestrian required to respond to alerts and warnings?</td>
</tr>
<tr>
<td>A010</td>
<td>155 Liability</td>
<td>Liability for faulty data</td>
<td>Who is liable if TMC, RSE, or PID provides incorrect data to vehicles? …and if vehicle OBE serves the data?</td>
</tr>
<tr>
<td>A034</td>
<td>157 Liability</td>
<td>Pedestrian Traffic Laws</td>
<td>Is pedestrian liable for own injuries if s/he fails to respond appropriately to alerts &amp; warnings?</td>
</tr>
<tr>
<td>T001</td>
<td>131 Certification</td>
<td>Ensure OBE or RSE Credential is valid</td>
<td>Anytime data is exchanged with an OBE or and RSE, the device must be trusted by the system.</td>
</tr>
<tr>
<td>T002</td>
<td>182 Communications</td>
<td>Data Exchange between RSEs, OBEs and other system objects</td>
<td>The choice of communication in this application is critical to its safe operation and effectiveness.</td>
</tr>
<tr>
<td>S001</td>
<td>195 Communications</td>
<td>Need for reliable real-time communications with PID for safety</td>
<td>For a safety application using a personal information device (PID) held by a pedestrian or bicyclist, the reliability of the data exchange is critical.</td>
</tr>
<tr>
<td>S005</td>
<td>199 Social Equity</td>
<td>Will the application protect all non-motorized users who have</td>
<td>In the definitions of the Physical Objects, “Pedestrians” are defined as follows: “Pedestrians are defined as individuals who are walking or who are on foot, or who are sitting or lying down.</td>
</tr>
<tr>
<td>S006</td>
<td>200 Social Equity</td>
<td>Will the application protect all types of pedestrians, including</td>
<td>A person with a mobility impairment may walk exceptionally slowly, or may be using a wheelchair,</td>
</tr>
<tr>
<td>S007</td>
<td>201 Social Equity</td>
<td>Will the application protect all types of pedestrians, including</td>
<td>The application must accommodate all types of pedestrians, including those with visual impairments.</td>
</tr>
<tr>
<td>S008</td>
<td>202 Social Equity</td>
<td>Affordability of Personal Information Devices</td>
<td>Unlike the case with motor vehicles, where certain equipment can be mandated, one cannot.</td>
</tr>
</tbody>
</table>
# Incident Scene Pre-Arrival Staging Guidance for Emergency Responders

<table>
<thead>
<tr>
<th>Application Specific Issues</th>
<th>Most Relevant Universal Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Certification and Interoperability</td>
<td>▪ Communications</td>
</tr>
<tr>
<td>▪ Interoperability with institutions (e.g., hospitals whose primary mission is not transportation)</td>
<td>▪ When is DSRC really needed?</td>
</tr>
<tr>
<td>▪ Data Governance</td>
<td>▪ Speed and reliability of safety-critical communications</td>
</tr>
<tr>
<td>▪ Are some of the data items (medical records, care facility status) available?</td>
<td>▪ Data Governance</td>
</tr>
<tr>
<td>▪ Governance</td>
<td>▪ Enforcement</td>
</tr>
<tr>
<td>▪ Who designs and tests the routing and staging algorithms?</td>
<td>▪ Liability</td>
</tr>
<tr>
<td>▪ Privacy</td>
<td>▪ Governance</td>
</tr>
<tr>
<td>▪ Handling of medical records</td>
<td>▪ Avoid driver distraction</td>
</tr>
<tr>
<td>▪ Carriers may consider their vehicle cargoes to be proprietary</td>
<td>▪ Liability</td>
</tr>
<tr>
<td>▪ Social equity</td>
<td>▪ Failure to follow advice from the system</td>
</tr>
<tr>
<td>▪ Ensuring that smaller service providers (e.g., a volunteer fire department or private ambulance) has access to the benefits</td>
<td>▪ System gives bad advice</td>
</tr>
<tr>
<td>▪ Interoperability between roadside equipment (RSE) and onboard equipment (OBE)</td>
<td>▪ Security of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE</td>
</tr>
</tbody>
</table>
Incident Scene Work Zone Alerts for Drivers and Workers

This application shares many of the same “work zone” application objects and flows with the maintenance and construction-oriented “Warning about Hazards in a Work Zone” application. This reflects common functionality and interfaces that could be used to enhance the safety of public safety professionals that work in proximity to travel lanes while responding to an incident. The “work zone” language in the application description and diagram reflects this commonality, though incident scenes are traditionally not called “work zones” by transportation or public safety professionals.
### Incident Scene Work Zone Alerts for Drivers and Workers

<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 (PID)s</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 PID:s</td>
<td>- Enforcement</td>
</tr>
<tr>
<td>- Speed and reliability of safety-critical communications</td>
<td>- Liability</td>
</tr>
<tr>
<td><strong>Data Governance</strong></td>
<td><strong>Governance</strong></td>
</tr>
<tr>
<td>- Vehicle movement data from this application could conceivably be used to improve future response to incidents, in terms of traffic management. What are the rules for using the data?</td>
<td>- Avoid driver and worker distraction</td>
</tr>
<tr>
<td><strong>Governance</strong></td>
<td><strong>Liability</strong></td>
</tr>
<tr>
<td>- Education on worker’s use of these systems and their limitations</td>
<td>- Failure to follow advice from the system</td>
</tr>
<tr>
<td><strong>Social equity</strong></td>
<td>- System gives bad advice</td>
</tr>
<tr>
<td>- Ensuring that smaller service providers (e.g., a volunteer fire department or private ambulance) has access to the benefits</td>
<td><strong>Interoperability</strong> between personal information devices (PID) roadside equipment (RSE) and onboard equipment (OBE)</td>
</tr>
<tr>
<td></td>
<td><strong>Security</strong> of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE</td>
</tr>
</tbody>
</table>
Poll Question 6

- Do you plan to visit the CVRIA website and add comments by the end of December?
  - Yes
  - No
  - Unsure
Intelligent Transportation Systems (ITS)
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