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

# *Connected Vehicle Reference Implementation Architecture Update*

Stakeholder's Webinar

November & December 2013

# Commercial Vehicle & Freight Applications of Connected Vehicle

- Commercial Vehicle Fleet Operations
  - Container Security
  - Container/Chassis Operating Data
- Commercial Vehicle Roadside Operations
  - *Smart Roadside Initiative (SRI)*
    - Safety Screening
    - Vehicle Credentialing
    - Overnight Truck Parking (included as part of Freight-Specific Dynamic Travel Planning in CVRIA)
- Freight Advanced Traveler Information System (FRATIS)
  - *Freight Drayage Optimization*
  - Freight-Specific Dynamic Travel Planning



- Applications for today's Webinar

# 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 (V2I Safety, Traffic Signals, Road Weather)
  - ❑ 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
  - Walt Fehr
  - Randy Butler
  - David Binkley, Ron Ice, Tom Lusco
  - Chris Karaffa, Jim Marousek
  - Dawn LaFrance-Linden, Scott Smith

# CVRIA Update Webinar #4 – Agenda

| Topic | Start | End |
|---|---|---|
| Welcome & Background/Overview | 2:00 | 2:10 |
| Introduce Applications of the Day | 2:10 | 2:15 |
| CVRIA Applications: | | |
| 1. Smart Roadside Initiative | 2:15 | 2:40 |
| 2. FRATIS Application (Freight Drayage) | 2:40 | 3:00 |
| Interface Selection / Standardization Planning | 3:00 | 3:15 |
| Pertinent Policy Issues | 3:15 | 3:30 |
| Q&A | 3:30 | 4:00 |

(All Times Eastern)

# CVRIA Update Webinar – Applications to be Reviewed

| Applications for Webinar | Date |
|---|---|
| V2I<br>• Red Light Violation Warning<br>• Curve Speed Warning<br>• Speed Harmonization (SPD-HARM) | Nov 6, 2013 |
| Signal Applications<br>• Intelligent Traffic Signal System<br>• Emergency Vehicle Priority<br>• Eco-Approach and Departure | Nov 14 |
| Road Weather<br>• Weather Responsive Traffic Management<br>• Enhanced Maintenance Decision Support | Nov 19 |

# CVRIA Update Webinar – Applications to be Reviewed, continued

| Topics | Date |
|---|---|
| **Freight & Fleet Operations**<br>• **Smart Roadside Initiative**<br>• **Freight Advanced Traveler Information Systems (FRATIS)** | **Nov 26** |
| Support Applications<br>• Data Distribution<br>• Communications Support<br>• Core Authorization | Dec 3 |
| Transit Applications<br>• Pedestrian & Turning Vehicle Crash Warning<br>• Integrated Multi-modal Payment | Dec 10 |
| R.E.S.C.U.M.E.<br>• Incident Scene Pre-Arrival Staging Guidance for Emergency Responders<br>• Incident Scene Work Zone Alerts for Drivers & Workers | Dec 17 |

(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 Testbed 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

# CVRIA Website Users Guide

- 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)

Functional & Requirements Tabs

*What about standards?*

Standards Tab

*What else is here?*

Resources / Glossary

*How do I provide feedback?*

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 Test Bed 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 ?**

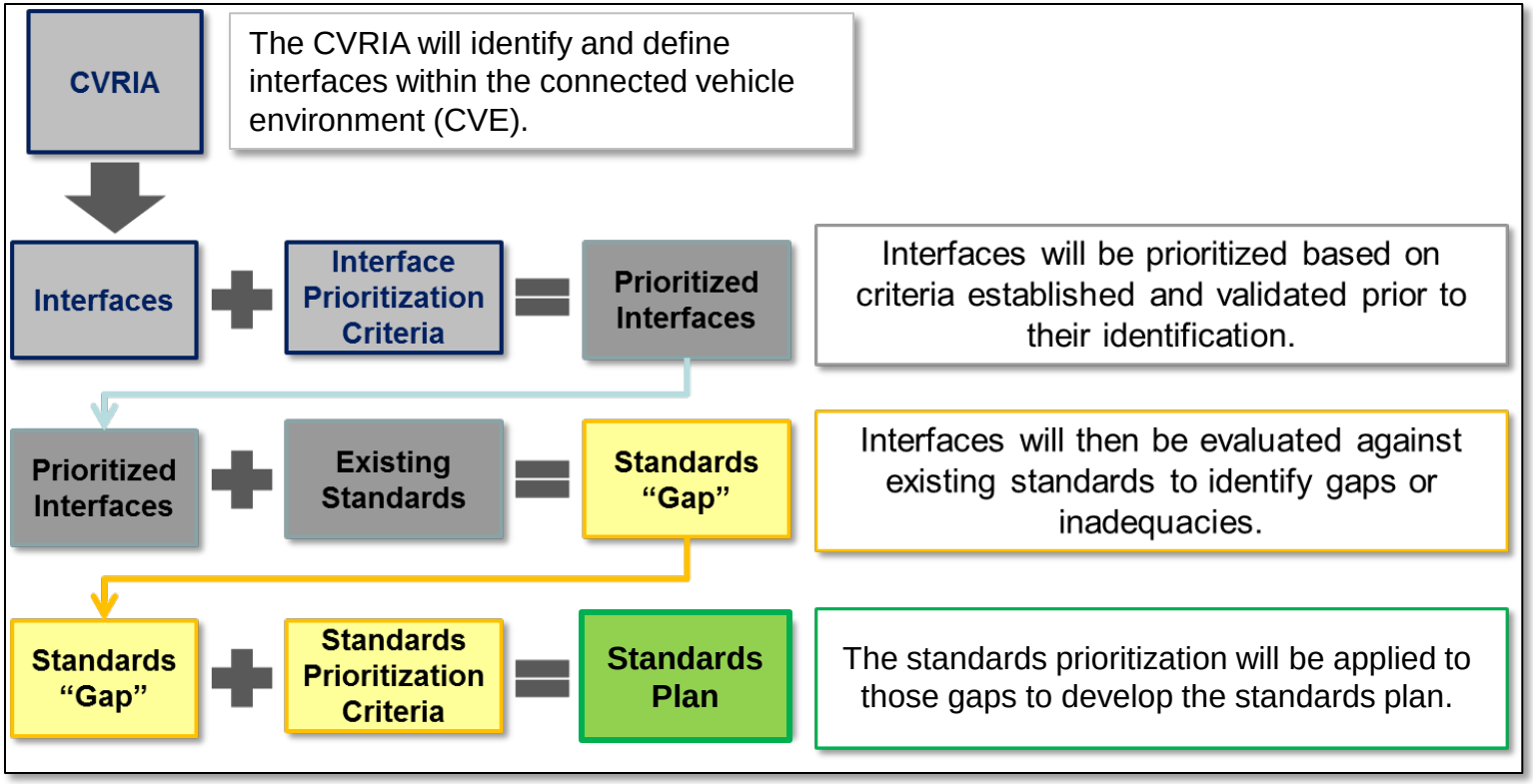
- Increased effort, cost
- Extended implementation
- Adapt standard to the extent possible, adapt interface as necessary

**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



# 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*

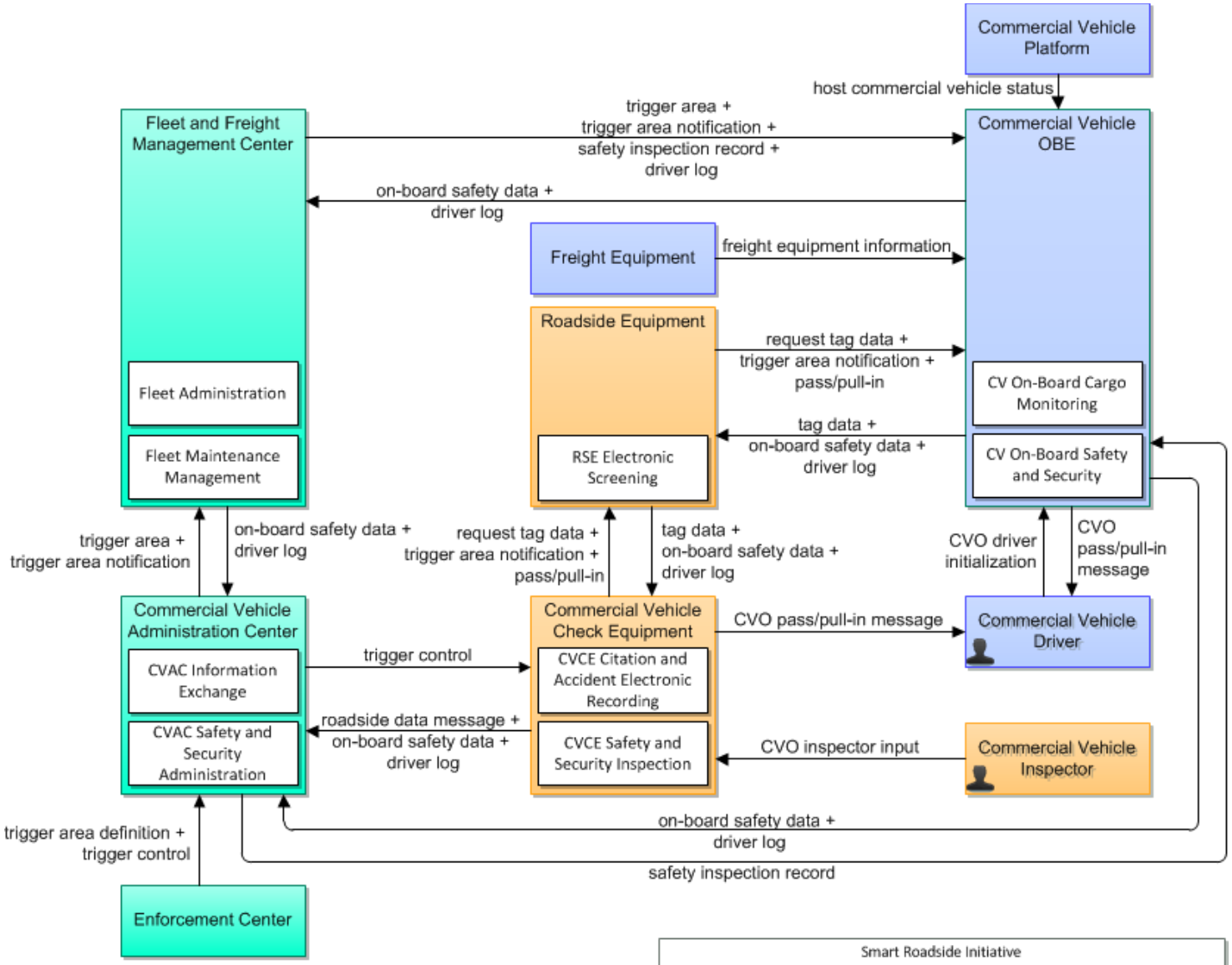
Scott Smith
USDOT / Research and Innovative Technology Administration /
Volpe National Transportation Systems Center

November 2013

# When we say “Policy”… Issue Areas Include

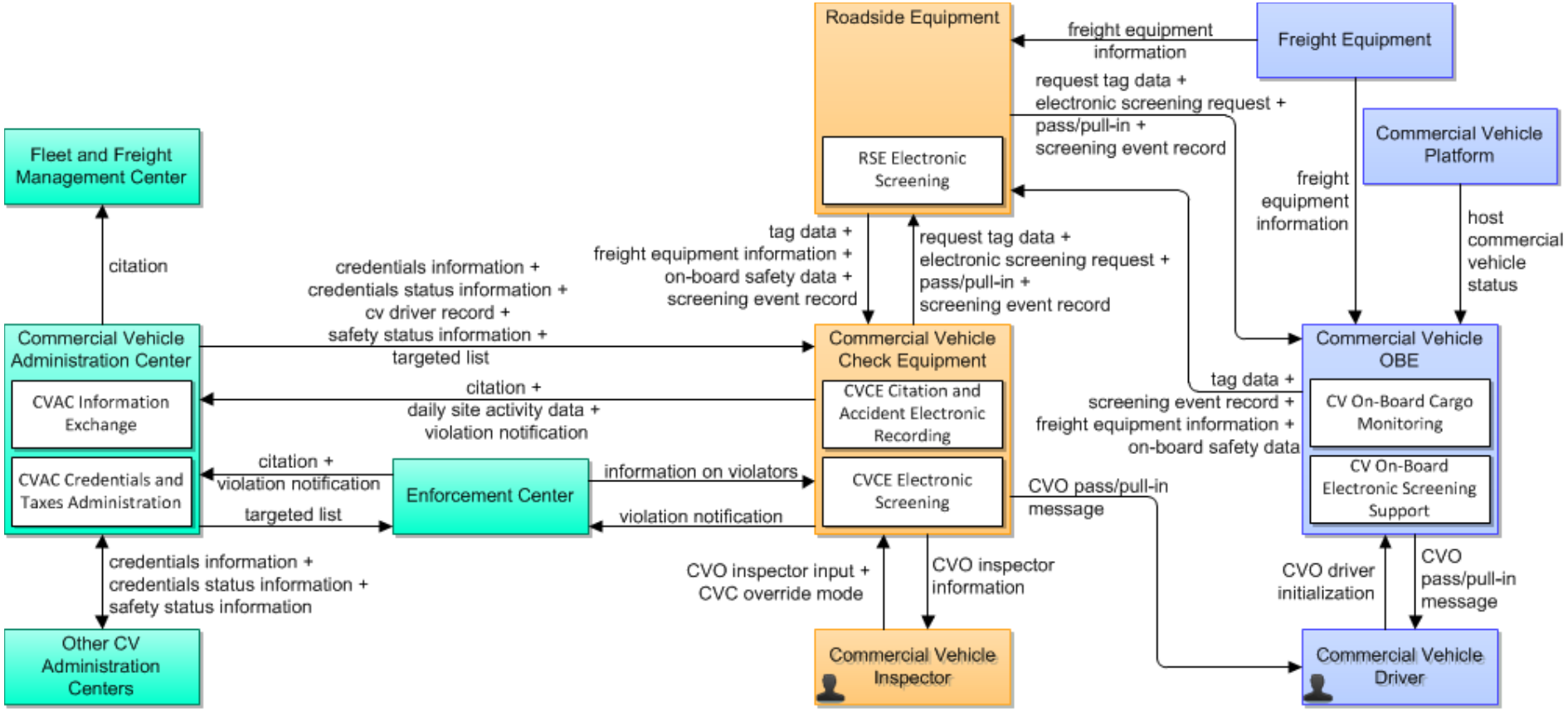
- **Certification……what certification is required?**
- **Communications……what technologies are preferred?**
- **Credentialing……who has access to CV systems?**
- **Data governance……who may access the data?**
- **Governance……what are the roles of the participants?**
- **Intellectual Property……..what are 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?**

# Smart Roadside Initiative - Safety Screening




| Smart Roadside Initiative | | | |
|---|---|---|---|
| 3 | Physical: Safety Screening | Nov 23, 2013 | NAT |

# Smart Roadside Initiative - Vehicle Credentialing

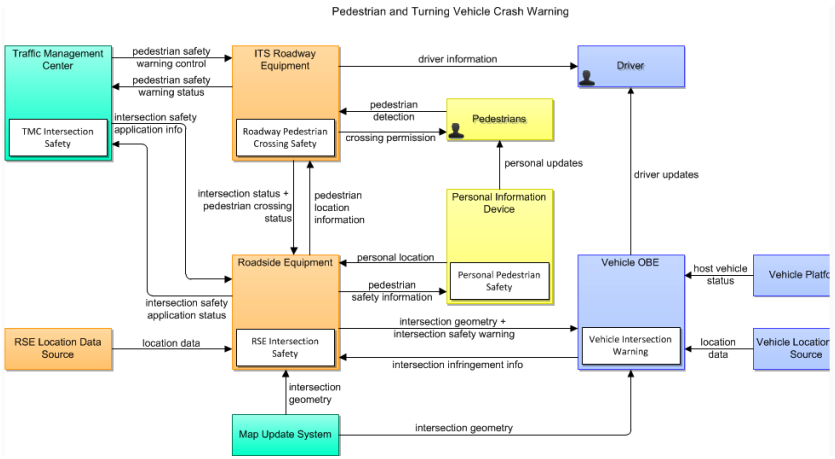



| Smart Roadside Initiative | | | |
|---|---|---|---|
| 3 | Physical: Vehicle Credentialing | Nov 23, 2013 | NAT |

# Policy Process (1/2)

## For each application:

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




| (link to web definition) ↓Flow↓ | ↓From (flow origin) | ↓To (flow destination) | Certification | Communications | Credentialing | DataGovernance | Governance | IT | Interoperability | Liability | Privacy | Resiliency | Security | Sociality | Pedestrian and Turning Vehicle Crash Warning 2 PTVCW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| crossing permission | ITS Roadway Equipment | Pedestrians | | | | | -- | | | Amy005 | | | | $005$006$007$0 | 248 |
| driver information | ITS Roadway Equipment | Driver | | | | | Amy001 | | Amy002 | Amy002 | | | | | 245 |
| driver updates | Vehicle OBE | Driver | Tim001 | Tim002 | | | -- | | Amy003 | Amy003 | | | | | 240 |
| host vehicle status | Vehicle Platform | Vehicle OBE | Tim001 | Tim002 | | | -- | -- | -- | -- | | Andy013 | Tim004 | | 239 |
| intersection geometry | Map Update System | Roadside Equipment | Tim001 | Tim002 | | | -- | | | Amy005 | | | | | 243 |
| | Map Update System | Vehicle OBE | Tim001 | Tim002 | | | -- | | | Amy003 Amy0 | | | | | 242 |
| | Roadside Equipment | Vehicle OBE | Tim001 | Tim002 | | | -- | | | Amy003 Amy0 | | | | | 249 |
| intersection infringement info | Vehicle OBE | Roadside Equipment | | | | | Amy031 | | Amy003 | Amy002 Amy0 | | | | | 241 |
| intersection safety application info | Traffic Management Center | Roadside Equipment | Tim001 | Tim002 | | | -- | | | | | | | | 796 |
| intersection safety application status | Roadside Equipment | Traffic Management | Tim001 | Tim002 | | | Amy007 | | | | | | | | 798 |
| intersection safety warning | Roadside Equipment | Vehicle OBE | | | | | -- | | Amy003 | Amy003 | | | | | 250 |
| location data | RSE Location Data Source | Roadside Equipment | Tim001 | Tim002 | | | Amy001 | | | Amy005 | | | Tim004 | | 799 |
| | Vehicle Location Data Source | Vehicle OBE | Tim001 | Tim002 | | | Amy004 | Amy02 | | Amy005 | | Andy008 | Tim004 | | 238 |
| pedestrian crossing status | ITS Roadway Equipment | Roadside Equipment | Tim00 | Tim002 | | | -- | | | Amy003 Amy0 | | | | $005$006$007$0 | 247 |
| pedestrian detection | Pedestrians | ITS Roadway Equipment | | | | | -- | | | | | | | $005$006$007$0 | 255 |
| pedestrian location information | Roadside Equipment | ITS Roadway Equipment | Tim001 | Tim002 | | | -- | | | | | | | $005$006$007$0 | 251 |
| pedestrian safety information | Roadside Equipment | Personal Information | Tim001 $002 | Tim002 | | | -- | | | Amy003 Amy0 | | | | $005$006$007$0 | 252 |
| pedestrian safety warning control | Traffic Management Center | ITS Roadway Equipment | | | | | | | | Amy003 Amy0 | | | | | 244 |
| pedestrian safety warning status | ITS Roadway Equipment | Traffic Management | | | | | | | | | | | | | 246 |
| personal location | Personal Information Device | Roadside Equipment | Tim001 $002 | Tim002 | | | Amy031 | | | Amy010 | | | | $005$006$007$0 | 253 |
| personal updates | Personal Information Device | Pedestrians | | | | | Amy033 | | | Amy034 | | | | $005$006$007$0 | 254 |
| signal phase and timing | ITS Roadway Equipment | Roadside Equipment | Tim001 | Tim002 | | | -- | | | | | | | | 797 |

# Policy Process (2/2)

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

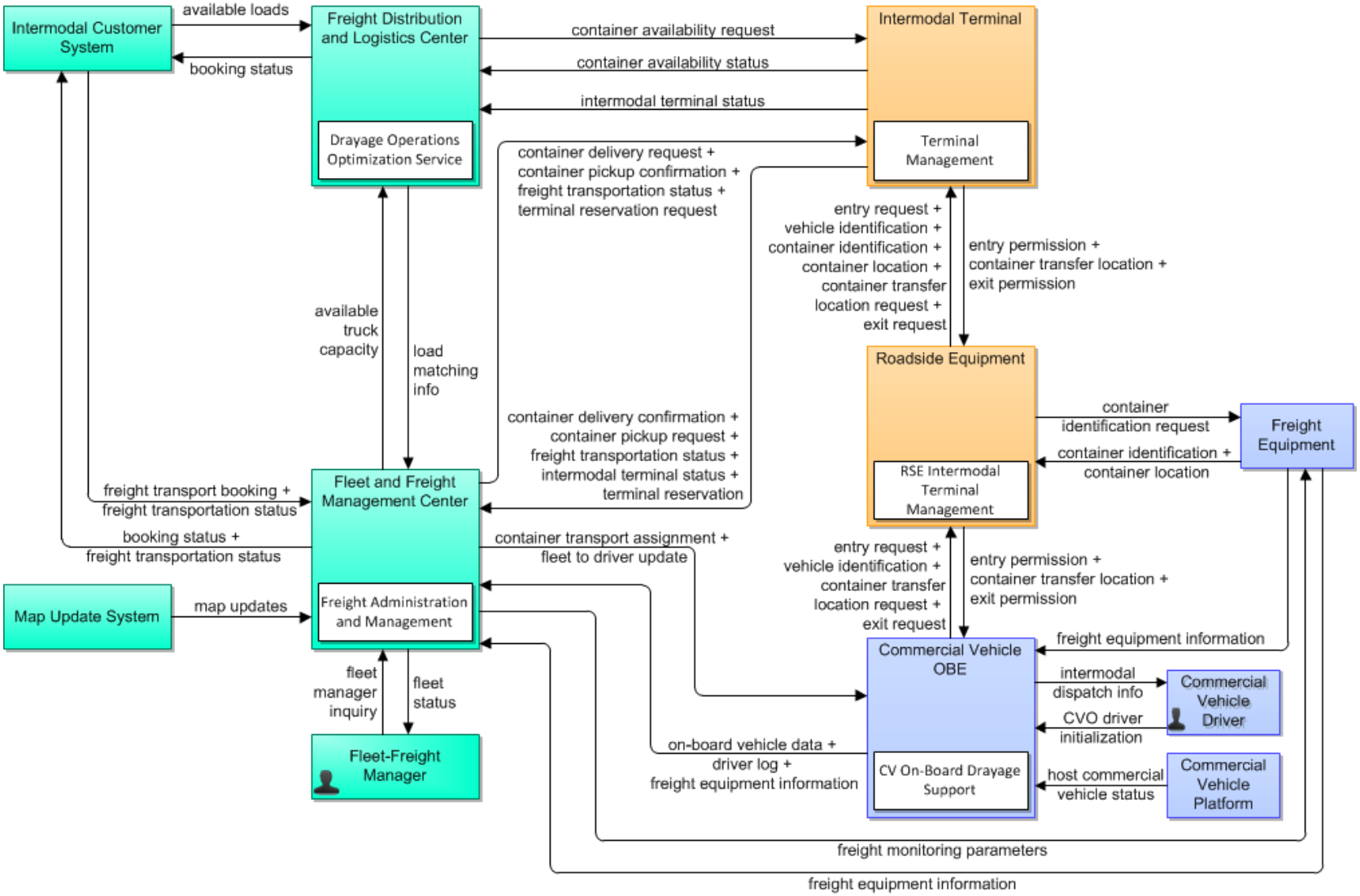
| (link to web definition) ↓Flow↓ | ↓From (flow origin) | ↓To (flow destination) | Certification | Communications | Credentialing | DataGovernance | Governance | IP | Interoperability | Liability | Privacy | Resiliency | Security | SocialEquity | Incident Scene Work Zone Alerts for Drivers and Workers | Route ID for the Visually Impaired | Pedestrian Mobility | Signal Phase and Timing | Pedestrian and Turning Vehicle Crash Warning |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | INC-ZONE | RVI | PEDM | SPAT | PTVCW |
| personal location | Personal Information Device | Roadside Equipment | T001 S002 | T002 | | | A031 | | | A010 | | | | S005S006S007S008 | 1477 | 1533 | 790 | 891 | 253 |
| personal updates | Personal Information Device | Pedestrians | | | | | A033 | | | A034 | | | | S005S006S007S008 | | | 792 | 893 | 254 |

| Spreadsheet | PO | PolicyArea | IssueTitle | IssueSummary |
|---|---|---|---|---|
| A031 | 143 | Governance | **Prevailing Data Source** | In cases where two or more sources provide location or other critical data, which source is s |
| A033 | 144 | Governance | **Pedestrian Traffic Laws** | Is pedestrian required to respond to alerts and warnings? |
| A010 | 156 | Liability | **Liability for faulty data** | Who is liable if TMC, RSE, or PID provides incorrect data to vehicles? ...and if vehicle OBE se |
| A034 | 167 | Liability | **Pedestrian Traffic Laws** | Is pedestrian liable for own injuries if s/he fails to respond appropriately to alerts & warnin |
| T001 | 181 | Certification | **Ensure OBE or RSE Credential is valid** | Anytime data is exchanged with an OBE or and RSE, the device must be trusted by the syste |
| T002 | 182 | Communications | **Data Exchange between RSEs, OBEs and other system objects** | The choice of communication in this application is critical to its safe operation and effective |
| S002 | 196 | Communications | **Need for reliable real-time communications with PID for safety** | For a safety application using a personal information device (PID) held by a pedestrian or bi |
| S005 | 199 | Social Equity | **Will the application protect all non-motorized users who have** | In the definitions of the Physical Objects, "Pedestrians" are defined as follows: *"Pedestria* |
| S006 | 200 | Social Equity | **Will the application protect all types of pedestrians, including** | A person with a mobility impairment may walk exceptionally slowly, or may be using a whe |
| S007 | 201 | Social Equity | **Will the application protect all types of pedestrians, including those with visual impairments?** | |
| S008 | 202 | Social Equity | **Affordability of Personal Information Devices.** | Unlike the case with motor vehicles, where certain equipment can be mandated, one canno |

# Smart Roadside Initiative

| Application Specific Issues | Universal Issues |
|---|---|
| ▪ **Governance:** How will the business rules for these applications build upon those for current similar initiatives, such as CVISN?<br>▪ **Credentialing:** What training is needed for those who perform the inspections and use the carrier / driver information.<br>▪ **Security:** How to prevent abuse by carriers, drivers and competitors?<br>▪ **Interoperability:** What information is required on the on-board safety and driver log links for the application to be useful?<br>▪ **Privacy:** What information (e.g., cargo, driver PII) is considered highly sensitive by carriers and drivers?<br>▪ **Social Equity:** Are carriers / drivers without SRI at a disadvantage? Can SRI be made available to all carriers, large and small? | ▪ **Interoperability** between roadside equipment (RSE) and onboard equipment (OBE)<br>▪ **Communications**<br>▫ When is DSRC really needed?<br>▪ **Security** of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE<br>▪ **Resiliency:** Dependence on reliable map and roadway geometry information<br>▪ **Social Equity**<br>▫ Safety and mobility impacts on non-connected vehicles<br>▫ Safety and mobility impacts on other road users<br>▪ **Data Governance**<br>▫ Privacy (movement tracking)<br>▫ Enforcement<br>▫ Liability |

# Freight Drayage



# Freight Drayage

| Application Specific Issues | Universal Issues |
|---|---|
| ▪ **Governance:**<br>▫ Who runs the Drayage Operations Optimization Service?<br>▪ **Security:**<br>▫ Prevent unauthorized users from finding out where valuable cargoes are located<br>▫ Prevent false routing and terminal entry instructions<br>▪ Sending trucks to hijackers<br>▪ Malicious actors gaining access to terminals or other sensitive areas<br>▪ **Privacy:** Carriers may consider their vehicle locations and cargoes to be proprietary. Will they share container information?<br>▪ **Liability**: Who pays if a cargo is lost, or a hazmat load causes damage? The container owner? Will a carrier or container owner regard participation in Freight Drayage as overly risky?<br>▪ **Social Equity:** Are carriers / drivers without the technology at a disadvantage? Can it be made available to all carriers, large and small? | ▪ **Interoperability** between roadside equipment (RSE) and onboard equipment (OBE)<br>▪ **Communications**<br>▫ When is DSRC really needed?<br>▪ **Security** of links between external data sources (Maps and RSE) and vehicle OBE; security of links to RSE<br>▪ **Resiliency:** Dependence on reliable map and roadway geometry information<br>▪ **Social Equity**<br>▫ Safety and mobility impacts on non-connected vehicles<br>▫ Safety and mobility impacts on other road users<br>▪ **Data Governance**<br>▫ Privacy (movement tracking)<br>▫ Enforcement<br>▫ Liability |

# Conclusion

- **Why perform this analysis?  Government role is to:**
  - Encourage use of connected vehicle technologies to provide public benefit
  - Discourage misuse that would create harm to the public
- **Tools that are available to the government:**
  - Resources and guidance
  - Regulation and policies
    - Provide a stable environment for others to use/deploy in
    - Build public trust in the system
    - Discourage misuse

# Poll Question 6

- **Do you plan to visit the CVRIA website and add comments by the end of December?**
  - Yes
  - No
  - Unsure

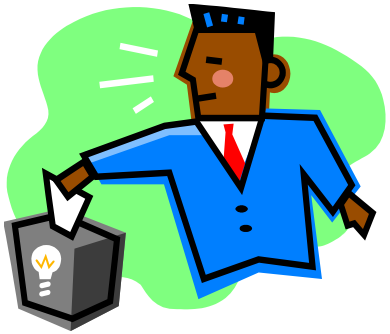
# Poll Question 7

- **Do you plan to attend any subsequent CVRIA webinars? (check all that apply)**
  - ❑ Support applications on Tuesday 12/3
  - ❑ Transit and non-motorized user applications on Tuesday 12/10
  - ❑ Public Safety on Tuesday 12/17
  - ❑ None

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

# *Connected Vehicle Reference Implementation Architecture Update*

Q&A + Final Thoughts

# THANK YOU

- 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