Preparing for Connected Vehicles
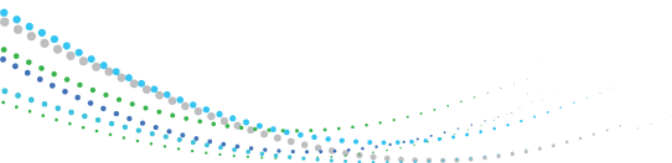
National Rural ITS Conference
Chattanooga, TN

Cliff Heise, Vice President Federal and Research - Iteris, Inc.

October 3, 2016

Topics

- Planning and Preparing for Connected Vehicles

- Connected Vehicle Reference Implementation Architecture

- Rural-Related Applications

- National ITS Architecture / CVRIA
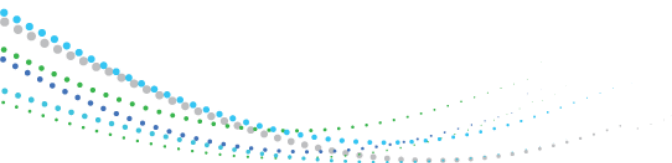
- Training Resources

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Enabling Connected Vehicle Environment

- Communications Technology
  - Wide-Area Wireless Communication
  - Short Range Wireless Communication
  - Internet

- Institutional
  - Rise of the Smart Device
  - Expectation of Connectivity
  - Privacy
  - Security

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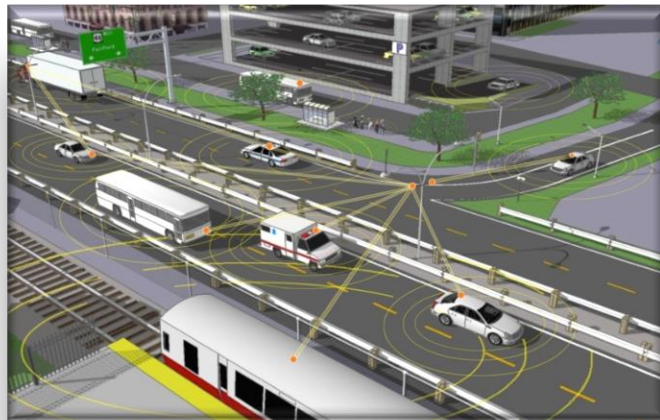
Why Connect Vehicles Now?

- Improve vehicle safety

- Communications standardization
    - 5.9 GHz Dedicated Short Range Communications Family
    - SAE J2735 Message Set for Wireless Communication to/from the Vehicle
        - Basic Safety Message (BSM)
        - Various Vehicle Probe Data Communications
        - Others…

- Motivated coalition of stakeholders including automakers

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More Connected Vehicle Information

- USDOT hosts a website with Connected Vehicle basics.
  - http://www.its.dot.gov/cv_basics/cv_basics_20qs.htm
    - Includes topics such as
      - How CV works?
      - How CV will be used?
      - What are CV benefits?
    - 20 Questions about CV

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Connected Vehicle is inherently complex

Improve Transit Reliability
- Connection Protection
- Transit Signal Priority

Improve Pedestrian Safety
- Pedestrian in Signalized Crosswalk Warning
- Intersection Movement Assist

Improve Air Quality
- Eco-Approach and Departure at Signalized Intersections
- Eco-Traffic Signal Timing

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Managing Complexity through Planning

- Planning breaks down complex systems into smaller, more manageable projects that are deployable

- Breaking the complexity down requires a clear vision or structure to the overall approach as early as possible

- The Connected Vehicle Reference Implementation Architecture (CVRIA) can be used to define the components involved in each CV application along with the institutional structure that supports the physical view
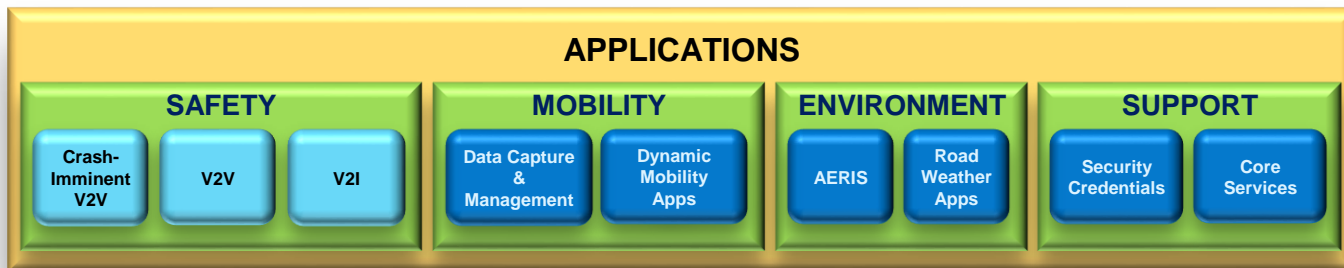
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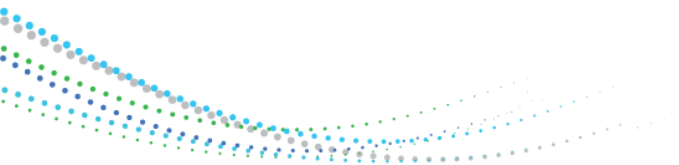
We Need a Common Language

- CVRIA manages the complexity of Connected Vehicle

- CVRIA models the Connected Vehicle functions and communications on a number of levels

- CVRIA establishes a framework for
  - Integrating connected vehicle technologies and
 - Identifying interfaces for standardization

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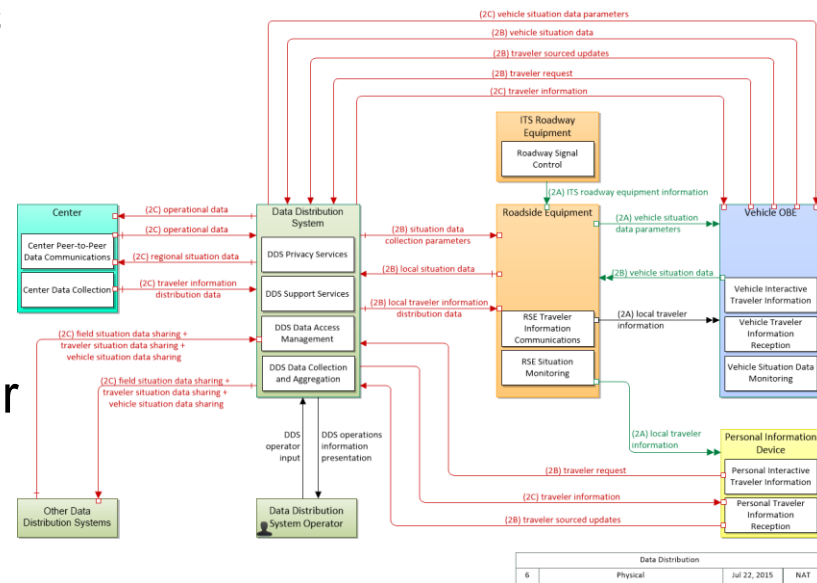
Background of CVRIA

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

- Looking ahead … 10-20 years when majority of vehicles are equipped in some way – establishing a robust connected vehicle environment

- With so many applications exposing so many opportunities for integration, an architecture is needed to put the components together

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CVRIA Views

- Used to capture stakeholders' concerns
    - Enterprises to carry out applications
    - Functions to satisfy requirements
    - Physical objects to implement that functionality
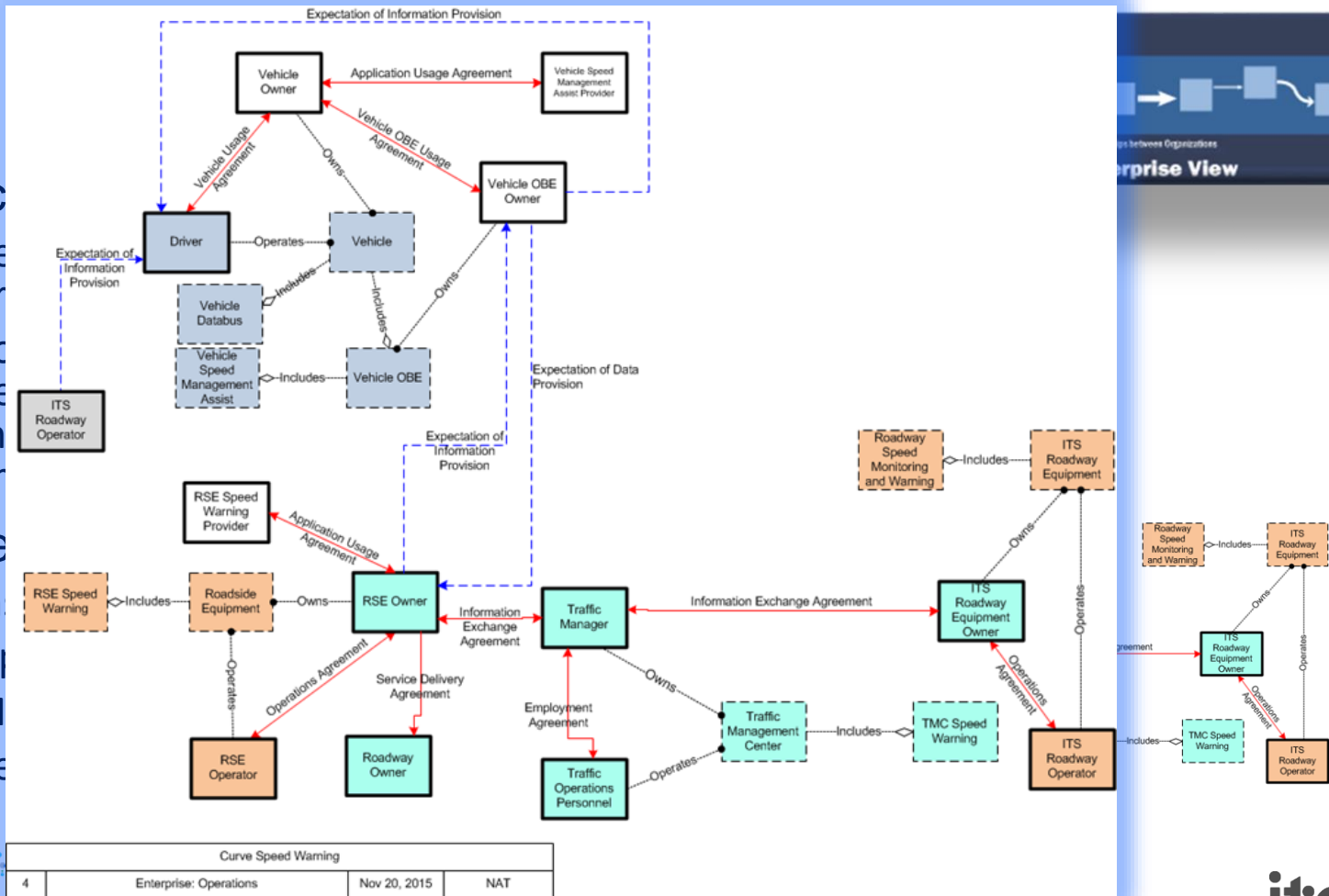   - Communications protocols necessary
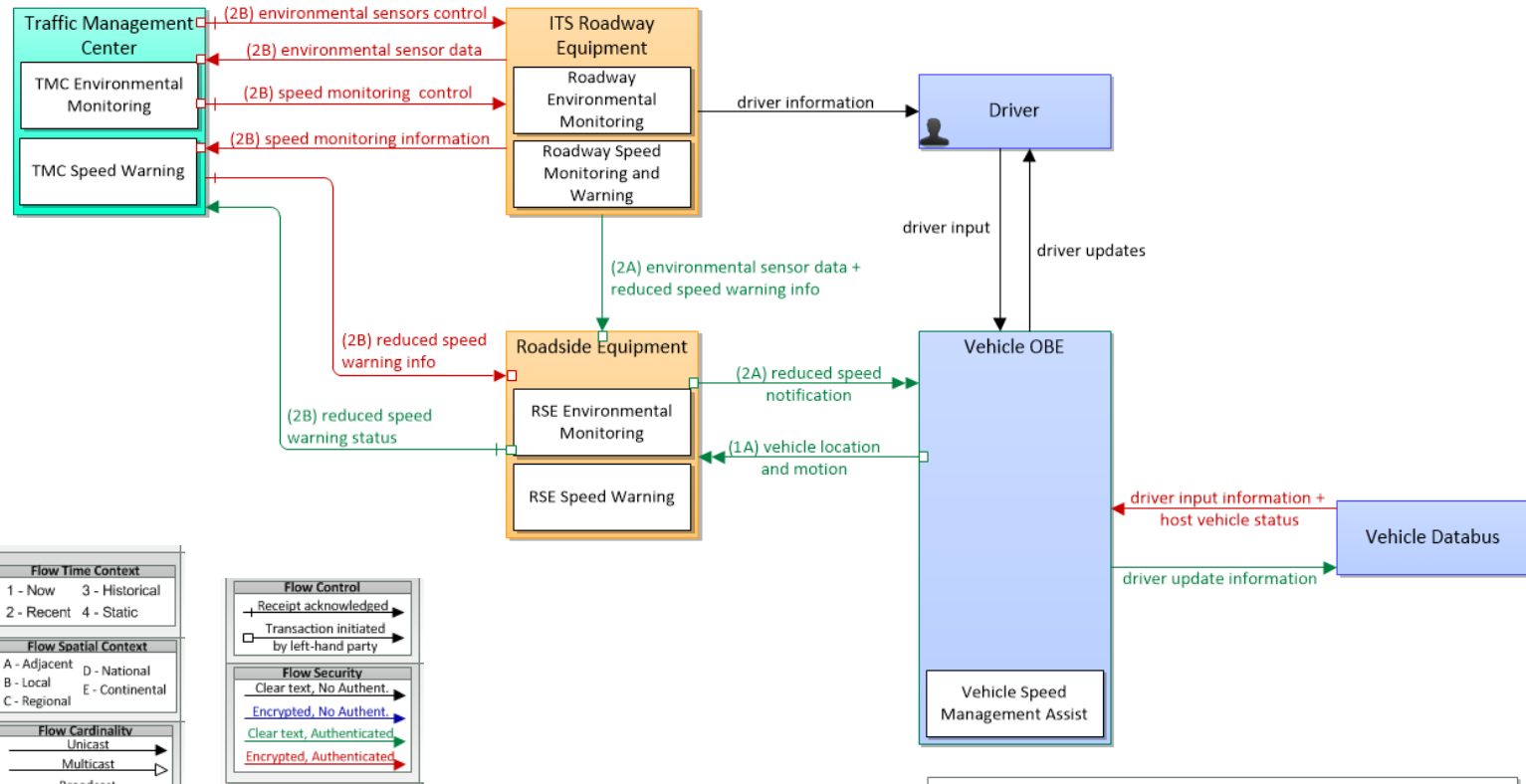
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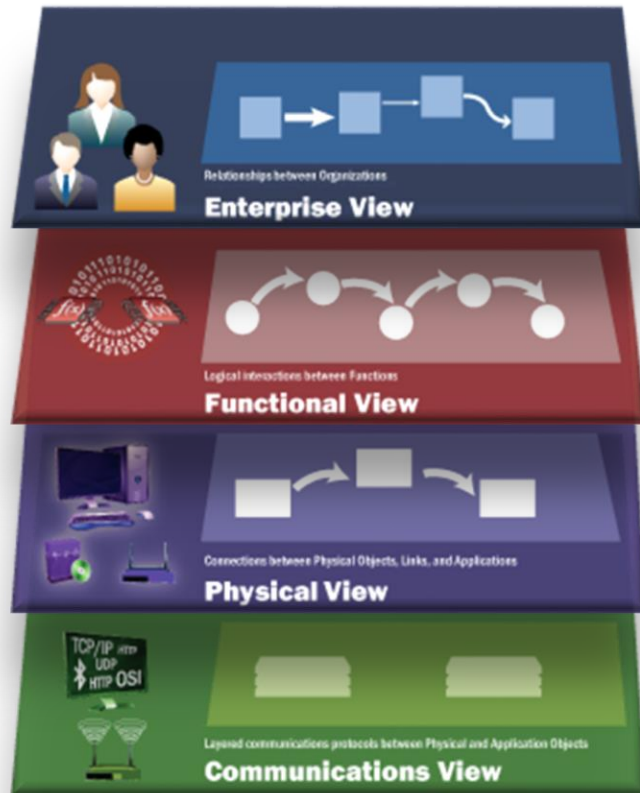
CVR

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Physical View – Curve Speed Warning Application

	Curve Speed Warning		
6	Physical	Jul 20, 2015	NAT

CVRIA Communications View

Layered communications protocols between Physical and Application Objects
Communications View

- Depicts:
  - Layered communications protocols that support communications between physical devices

- Identifies options for…
  - Identity and appropriateness of protocols at all layers
  - How these protocols ensure or support:
    - ○ Anonymity preservation
    - ○ Non-repudiation
    - ○ Message integrity
  - Status of protocols as standards or privately provided protocols and the implications of their use from an evolve-ability perspective

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CVRIA Communications View Example

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Rural-related Applications

- Rural Challenges
  - Rural Intersection Safety – line of sight issues
  - Run off Road Incidents
  - Road Weather Information Dissemination
  - Mayday or Collision Notification for Incident Response
  - Limited Transit Options
- Needs
  - Reduce Crashes
  - Improve Road Weather Information Collection/Dissemination
  - Improve Crash Notification and Emerency Response Time
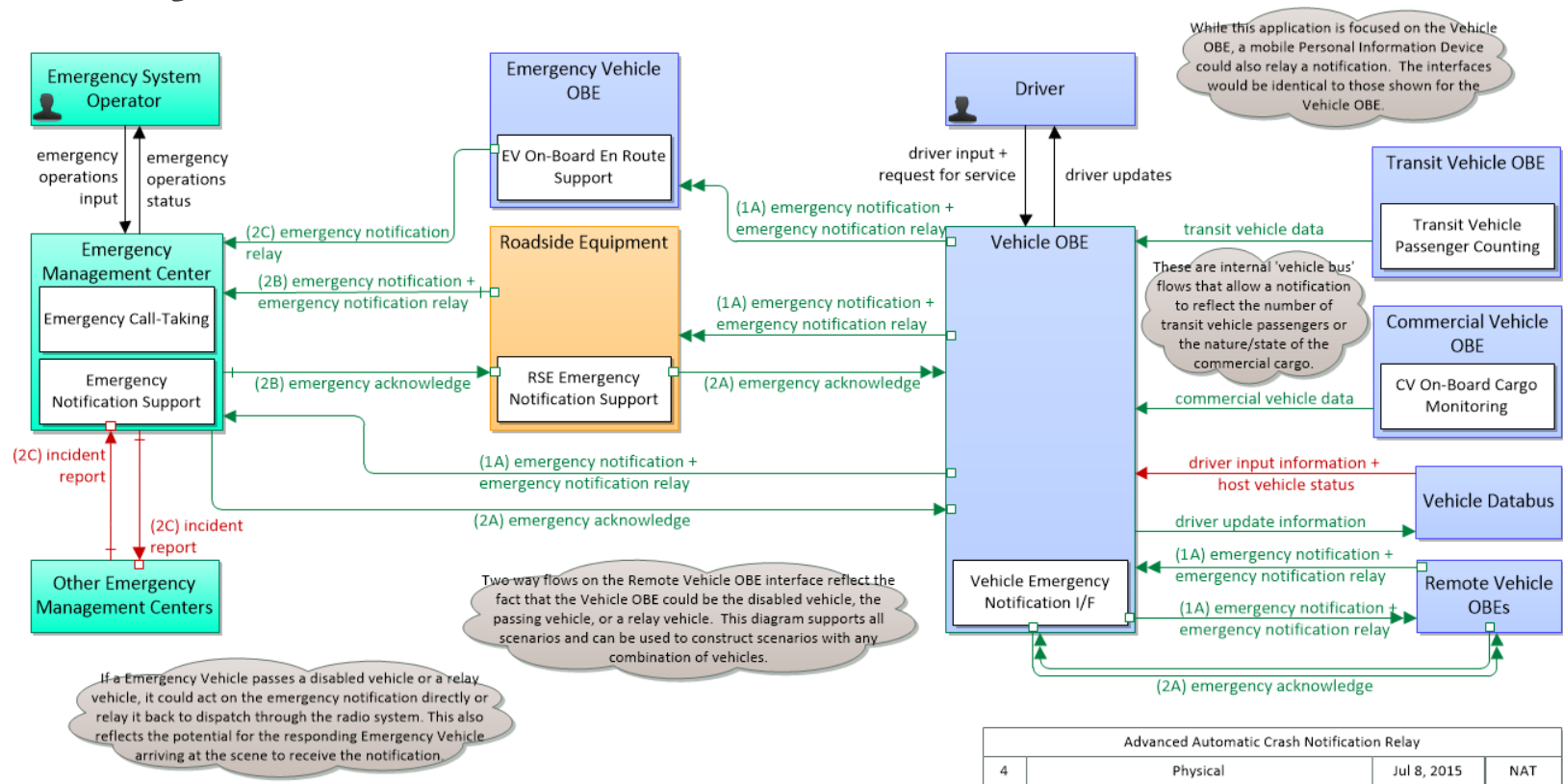 - Improve Accessibility

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Curve Speed Warning

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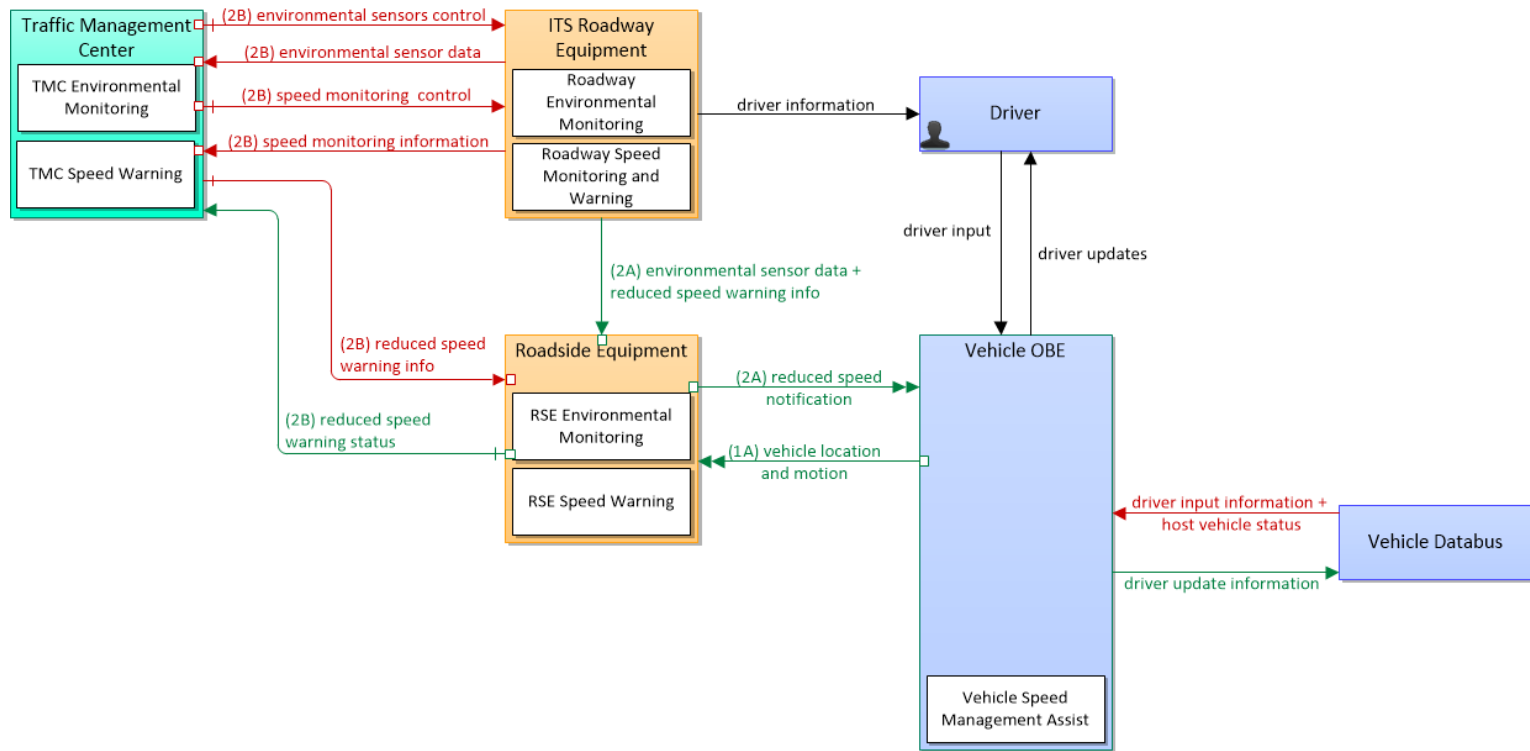
Curve Speed Warning			
6	Physical	Jul 20, 2015	NAT

Spot Weather Impact Warning
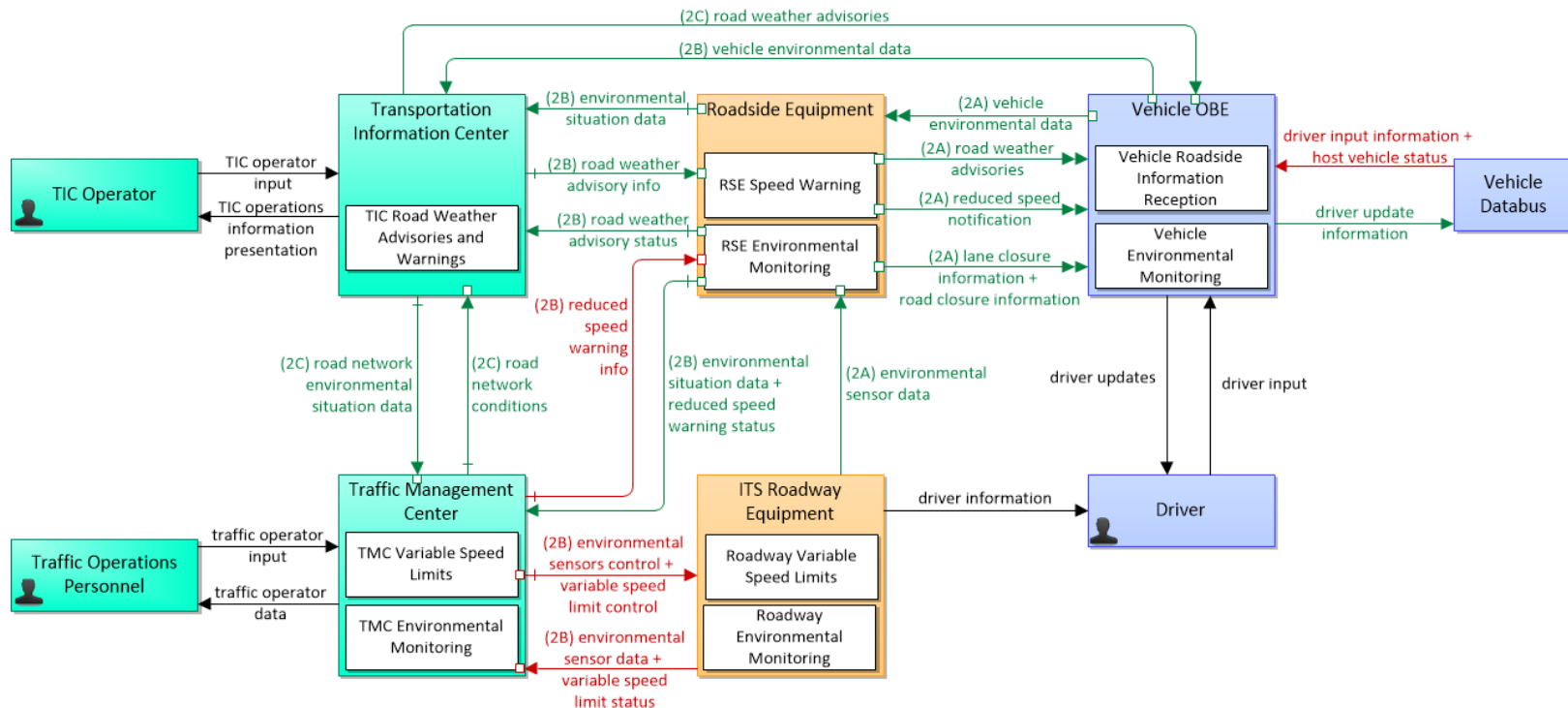
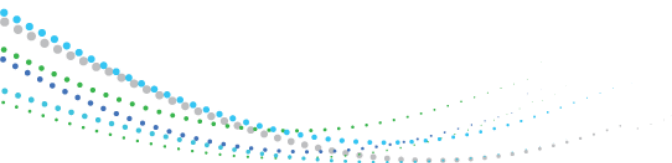| Spot Weather Impact Warning			
5	Physical	Jul 8, 2015	NAT

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Advanced Automatic Crash Notification Relay

# Dynamic Transit Operations
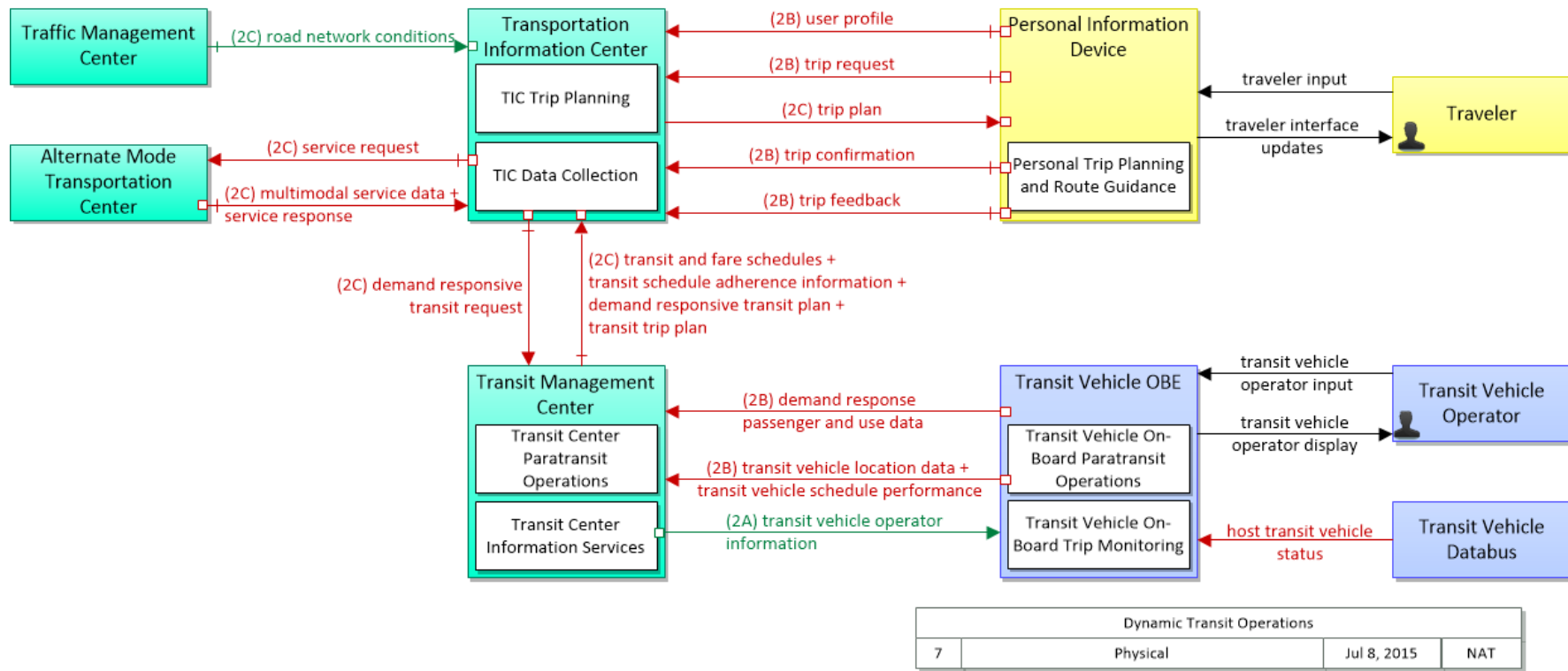
Preparing for Connected Vehicle

- Educate yourself about Connected Vehicle solutions and concepts

- Follow your concept development and planning processes

- Identify your transportation needs

- Evaluate available solutions

- Develop system concept and structure over the life cycle

- Execute your transportation planning process

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CVRIA Website

- Organizes the architecture content in a layered hypertext format

- Allows for easy and quick targeted access to topics of interest

- Is updated as CVRIA evolves

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

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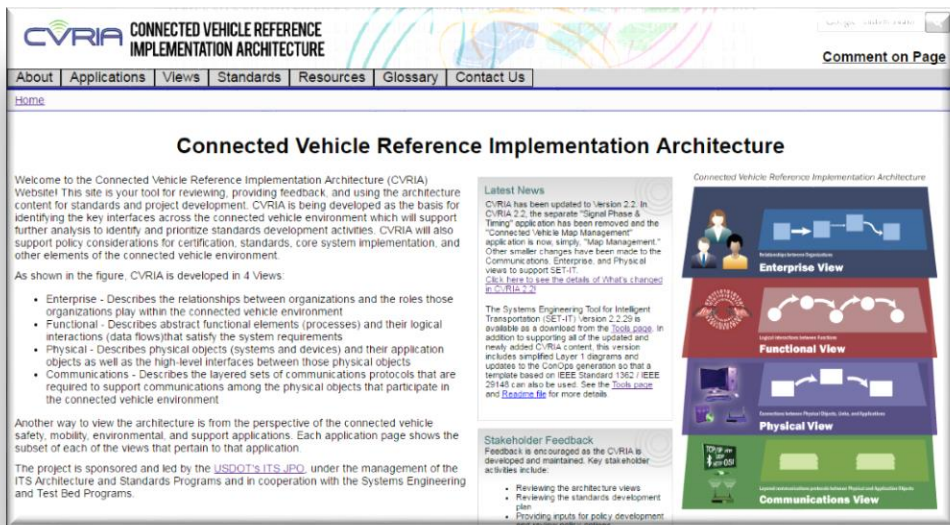
SET-IT

- Systems Engineering Tool for Intelligent Transportation (SET-IT)
  - Purpose: Develop project architectures for pilots, test beds and early deployments of connected vehicles
  - Applies CVRIA – build project specific architectures based on a common reference
    - Drawings and database definitions organized into one framework
    - Document generator builds Concepts of Operation using data and diagrams
  - Start with CVRIA and customize it with your names for Elements and Stakeholders
 - Available for free download from CVRIA website

Features of SET-IT

- Create physical, enterprise and communications views of a connected vehicle project architecture based upon CVRIA

- Create physical, enterprise and communications diagrams

- Copy and customize connected vehicle applications and needs from CVRIA

- Output diagrams and tables of architecture components

- Create a concept of operations document for a project

- Provides search box at the bottom of the Overview/Applications page where you first select applications
  - Provides a good way to narrow down the CVRIA applications that pertain to things you are interested in
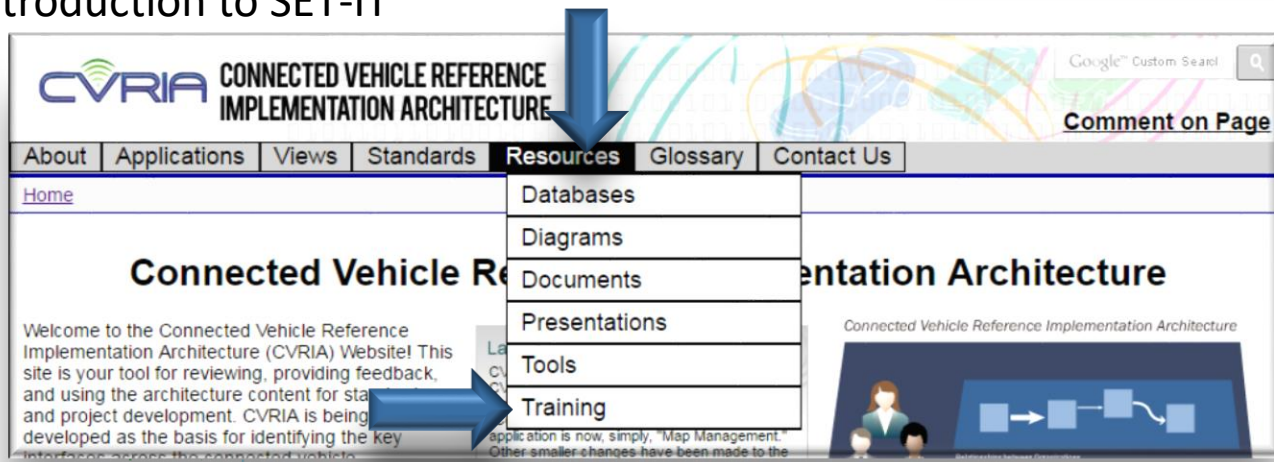
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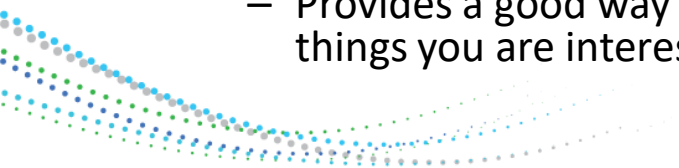
National ITS Architecture and CVRIA

- CVRIA is being integrated with the National ITS Architecture
  - Available in early 2017

- New software tool set will also be developed
  - SET-IT will be revised for ITS content to apply to project development
  - New software tool being developed to support regional ITS architecture development and maintenance for planning support
    - Replaces functionality found in today's Turbo Architecture software tool
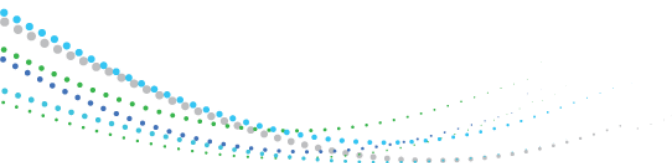
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CVRIA Training and Resources

- CVRIA website at www.iteris.com/cvria/

- On-line Training Courses
  - Introduction to CVRIA
  - Introduction to SET-IT

Training on CVRIA and SET-IT is absolutely an essential use of your time if you are going to be developing an architecture involving connected vehicles
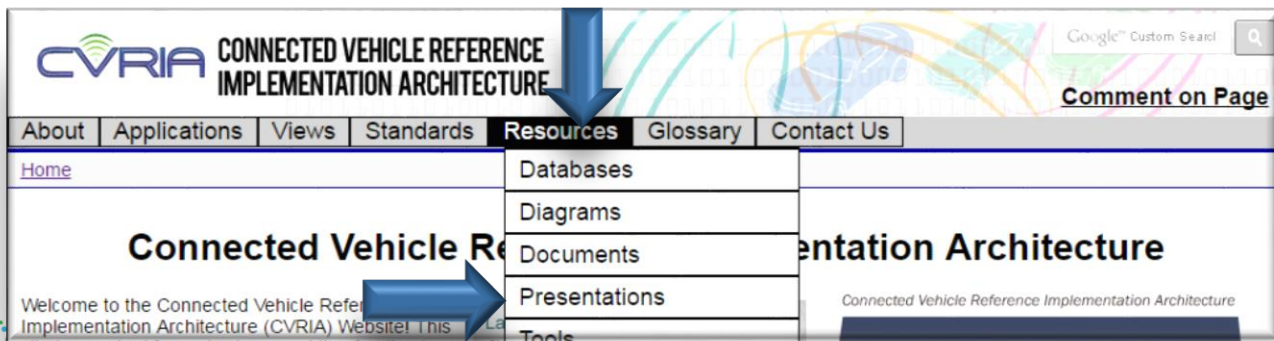
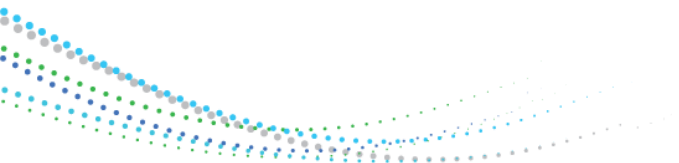**iteris**®

CVRIA Training and Resources

- CVRIA Webinar Series
  - http://www.iteris.com/cvria/html/resources/presentations.html

1. Red light Violation Warning
2. Curve Speed Warning
3. Speed Harmonization
4. Intelligent Traffic Signal System
5. Emergency Vehicle Priority
6. ECO Approach and Departure
7. Weather Responsive Traffic Management
8. Enhanced Maintenance Decision Support
9. Smart Roadside Initiative
10. Freight Advanced Traveler Information Systems
11. Data Distribution
12. Communications Support
13. Core Authorization
14. Pedestrian in Signalized Crosswalk Warning
15. Integrated Multi-Modal Payment
16. Incident Scene Pre-Arrival Staging Guidance for Emergency Responders
17. Incident Scene Work Zone Alerts for Drivers and Workers

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Connected Vehicle is Coming

- It is building on ITS with provision of new data sources

- To prepare, we need to…
  - Understand Connected Vehicle Applications
  - Educate ourselves about the CV Environment including support
    - Data Distribution
    - Security and Credentials Management
  - Establish Connected Vehicle vision/approach that meets transportation needs
  - Plan evolutionary deployment of Connected Vehicle

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Thank You!

Questions?

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