



Connected Vehicle Architecture Workshop

Introduction

June 16, 2016

Workshop Objectives

- Provide the latest information on the evolution of the Connected Vehicle Reference Implementation Architecture (CVRIA) and the Systems Engineering Tool for Intelligent Transportation (SET-IT)
- Present the approach for integrating the National ITS Architecture and CVRIA
- Gather feedback on the CVRIA including recommendations for future changes/ additions



USDOT ITS Architecture and Standards Programs

- Architecture and Standards Programs directed by Legislation
 - 1991 Intermodal Surface Transportation Equity Act (ISTEA)
 - 1995 Transportation Equity Act for the 21st Century (TEA-21)
 - 2005 Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)
 - 2012 Moving Ahead for Progress in the 21st Century Act
 - 2015 Fixing America's Surface Transportation Act (FAST Act) – Title 23 Section 517

“...the Secretary shall develop and maintain a national ITS architecture and supporting ITS standards and protocols to promote the use of systems engineering methods in the widespread deployment and evaluation of intelligent transportation systems as a component of the surface transportation systems of the United States.”

Conformity with National Architecture - “...intelligent transportation system projects carried out using amounts made available from the Highway Trust Fund, including amounts made available to deploy intelligent transportation systems, conform to the appropriate regional ITS architecture, applicable standards, and protocols...”



USDOT ITS Architecture and Standards Programs

- FHWA Rule 940 and FTA Policy on ITS Architecture and Standards (January 2001)
 - Regional ITS Architectures shall be developed in all regions deploying ITS with Federal Funds
 - Regional ITS Architectures shall use National ITS Architecture as a resource
 - Establishes common language for stakeholders to communicate ITS plans
 - ITS Projects shall be based on systems engineering analysis and identify portions of regional ITS architecture being implemented
 - ITS Projects shall use applicable ITS standards
- ITS Architecture and Standards Programs in ITS JPO established with legislative direction and guided by FHWA Rule/FTA Policy AND Good Practice



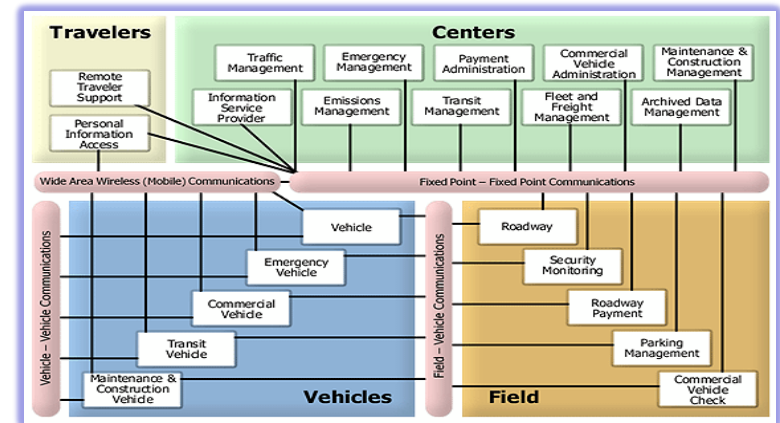
USDOT ITS Architecture and Standards Programs

- ITS Architecture Program
 - Define and evolve the National ITS Architecture
 - Define interfaces for which standards are required
 - Provide tools for regional ITS architecture development
 - Develop Connected Vehicle Reference Implementation Architecture (CVRIA)
- ITS Standards Program
 - Direct work with standards development organizations (SDO)
 - Reduce costs and accelerate implementation of ITS standards
 - Minimize duplication of standards development
 - Increase opportunities for industry
 - Support international standards harmonization when beneficial



National ITS Architecture Overview and Status

- National ITS Architecture provides a common framework for planning and defining ITS projects
 - Version 7.1 released in April 2015
 - Supports ITS planning process
 - Turbo Architecture Version 7.1 software tool
 - Aids in tailoring of ITS Architecture content
 - Supports Rule 940 requirements
- National ITS Architecture Program
 - Facilitates Architecture evolution
 - Deployment support providing technical assistance and education
 - Workshops – 11 conducted in past year
 - Systems Engineering for ITS
 - ITS Architecture Development
 - Turbo Architecture Training
 - Border Architecture and Systems Engineering support
 - Connected Vehicle Architecture development



National ITS Architecture Overview and Status

- Connected Vehicle Reference Implementation Architecture (CVRIA)
 - Identifies key interfaces and functionality across the connected vehicle environment or Cooperative ITS (C-ITS) as it is known internationally
 - Supports identification and prioritization of standards development activities
 - CVRIA Version 2.2 released in May 2016
- Systems Engineering Tool for Intelligent Transportation (SET-IT) software
 - Provides tools for tailoring CVRIA content
 - Connected Vehicle project planning
 - Connected Vehicle project development
 - Systems engineering process
 - Concept of Operations
 - SET-IT Version 2.2 released in May 2016

CVRIA Website: www.iteris.com/cvria

The screenshot shows the CVRIA website homepage. At the top, there is a navigation menu with links for 'About', 'Applications', 'Views', 'Standards', 'Resources', 'Glossary', and 'Contact Us'. Below the menu, the main heading reads 'Connected Vehicle Reference Implementation Architecture'. The page is divided into several sections. On the left, there is a 'Welcome' message and a list of views: Enterprise, Functional, Physical, and Communications. On the right, there are 'Latest News' and 'Stakeholder Feedback' sections. The 'Views' section includes a vertical stack of four diagrams: 'Enterprise View' (showing organizational relationships), 'Functional View' (showing process flows), 'Physical View' (showing system components), and 'Communications View' (showing network protocols).



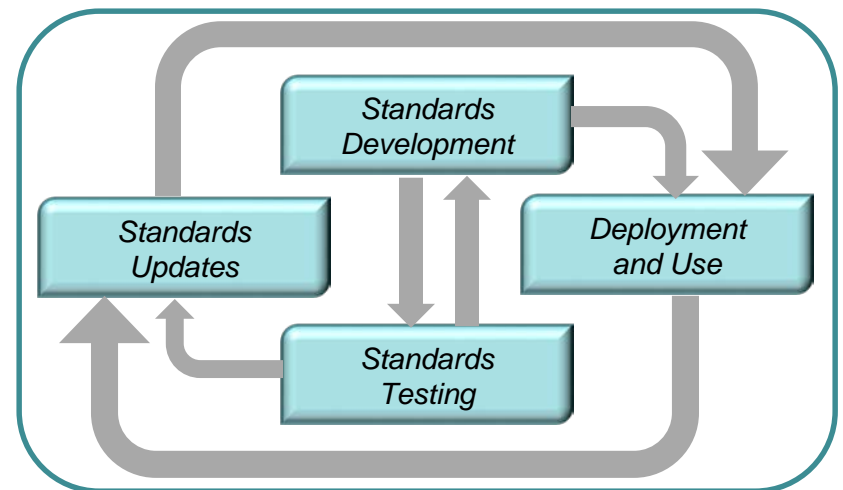
Architecture Evolution – What is Next?

- The National ITS Architecture and CVRIA are being integrated into common framework
 - Using database and diagram schema from CVRIA
 - Providing support for ITS and CV project architecture development and planning
- New software toolset
 - Regional Planning Tool with similar functionality to Turbo Architecture
 - Support for Regional ITS Architecture development and maintenance
 - Project Development Tool with similar functionality to SET-IT
 - Support for project architecture definition and systems engineering process
 - Concept of Operations
- New Architecture and Toolset scheduled for release at the end of 2016



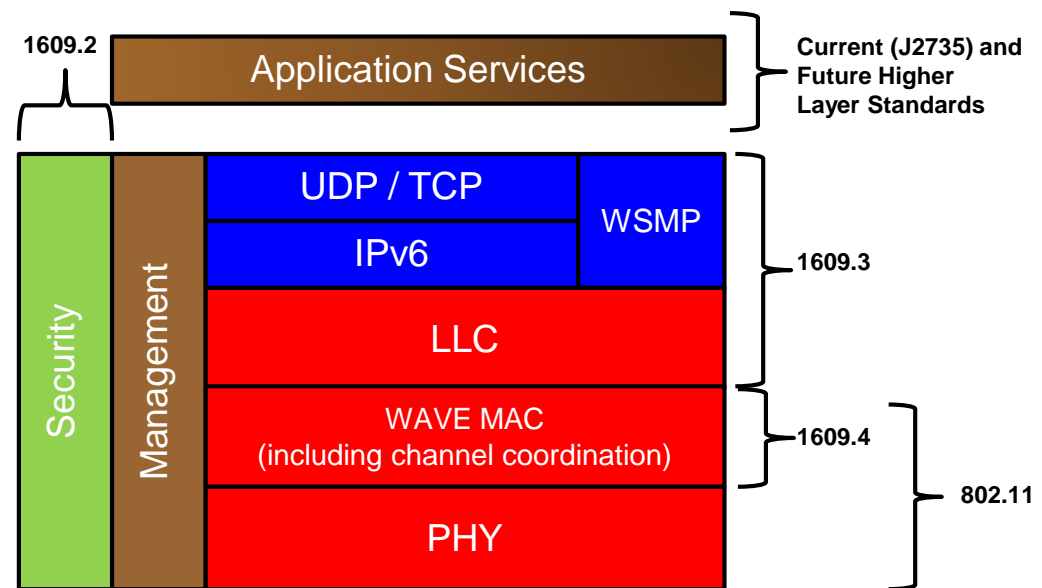
Standards Participation

- Standards are living documents
 - They require inputs from stakeholders, testers and deployers
 - Participation in working groups developing and updating standards contributes to complete and correct standards
- ITS JPO builds stakeholder engagement into CV programs
 - Standards participation language incorporated into statements of work
 - Travel reimbursement for select international standards efforts



Overview and Status of ITS Standards

- Covers vehicle to infrastructure (V2I), vehicle to device (V2D), and vehicle to vehicle (V2V) communications
 - Dedicated Short Range Communications (DSRC) at 5.9 GHz for safety applications
 - DSRC and other wireless technologies (e.g. LTE) for non-safety applications
 - SAE J2735 – message and dialog definitions for V2V, V2I and V2D
- SAE J2945/1 – Basic Safety Message (BSM) performance requirements for NHTSA rule-making
- IEEE 1609.x – standards covering network and transport layer protocols and security management
- IEEE 802.11 – wireless PHY and MAC protocols for DSRC that IEEE 1609 and SAE J2735 ride on



All standards are recently published or under revision



Standards for Connected Vehicle

- To deploy a large scale Connected Vehicle system today, a systems architect needs a basis in architecture and interface definitions
- Various architectures and tools are available: CVRIA/SET-IT (FRAME and the ITS-S in the EU)
 - Standards selection recommendations for interfaces are currently identified at only highest level
 - In some cases, standards do not exist
 - No guidance on which interfaces are best when multiple options exist
 - In many cases, it is a significant effort to identify the requirements necessary to specify a given interface
 - Development of individual specifications can lead to an increased risk of proprietary solutions and less interoperability



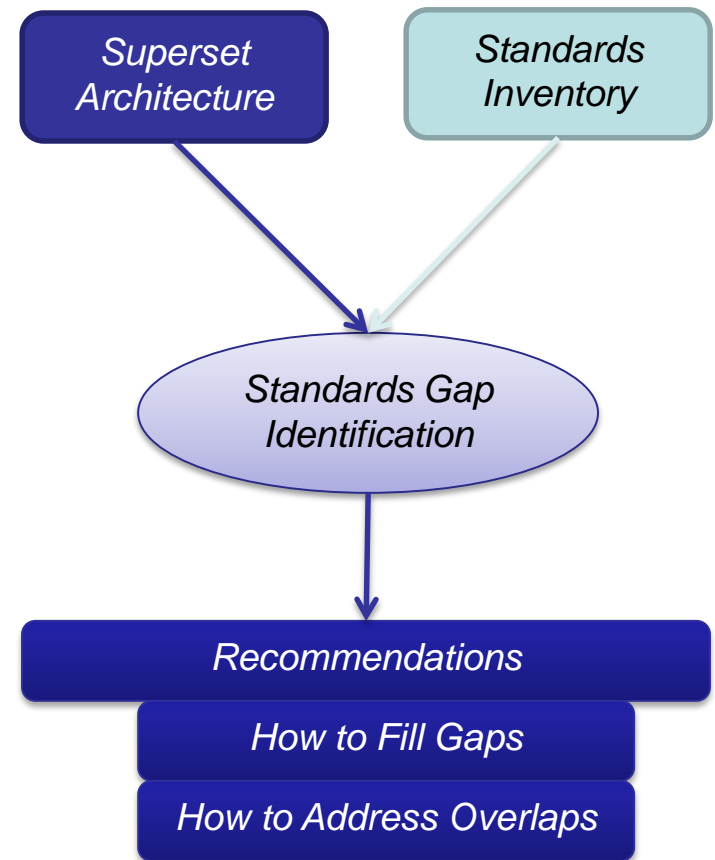
Harmonization Task Group 7

- HTG7 is an activity of the US-EU Standards Harmonization Working Group, and with the full participation of Australia
- Goal: to evolve the knowledge base and tools in a unified, collaborative manner
 - Detailed standards choice recommendations, enhanced tools
 - Identification of standards gaps
 - Opportunities for collaborative development
 - Identification of interfaces in public interest
 - Optimize the number of standards (but no less than needed) to assure an overall efficient system
- Collaborate to achieve harmonized results, sharing labor and expertise
 - Incentivize more similar deployments across regions
 - Create an opportunity for cooperative standards development



HTG7 Traceability and Process

- HTG7 starts with a significant body of work:
 - More than 1000 relevant standards
 - Architectures from the US, EU and AU
- HTG7 will produce:
 - A comprehensive CV architecture that is inclusive of its major sources
 - A set of tools for identifying and specifying the standards appropriate to satisfy interfaces
 - A set of tools including an interactive website enabling *interaction and feedback* with and from the broader stakeholder community
 - An assessment of gaps in CV standards



Connected Vehicle Initiatives

- ITS-JPO's Architecture and Standards Program supports the Connected Vehicle Initiatives
 - Connected Vehicle Pilot Deployments
 - Tampa
 - Wyoming
 - New York City
 - Smart Cities Challenge
 - Other DOT Initiatives
- Support includes
 - Technical assistance with CVRIA and SET-IT application
 - Review of Systems Engineering documentation
 - Support at initiative meetings and reviews
 - Workshops and training for CVRIA and SET-IT application



Workshop Agenda

- Introduction 9:00 AM
- CVRIA Overview 9:20 AM
- CVRIA Website Tour 9:50 AM
- National ITS Architecture / CVRIA Integration 10:20 AM
- Break 10:35 AM
- Attendee Feedback on CVRIA 10:50 AM
- SET-IT Software Tour 11:20 AM
- SET-IT Use Example 11:50 AM
- Wrap-up 12:20 PM
- Adjourn 12:30 PM

