



# ARC-IT v8 – The New National ITS Architecture & Its Tools

Public Workshops  
Dearborn, MI      San Jose, CA  
July 26-27, 2017      August 9-10, 2017

**ARC-IT**      Version **8.0**

Including the National ITS Architecture and CVRIA



# ARC-IT Workshop Purpose

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- Describe the integration of the National ITS Architecture, version 7.1 with the Connected Vehicle Reference Implementation Architecture (CVRIA)
- Illustrate how ARC-IT relates to the National ITS Architecture v7.1 and CVRIA
- Describe the tools—what they are, what they are used for, and who should use them in planning for deployment
  - Learn by Doing – work the website, install/use the tools
- Describe how ARC-IT fits into the deployment process



# ARC-IT v8 Workshop Agenda, day 1

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Topics – Day 1	Start	End
Welcome & Introduction	9:00	9:15
Background & History	9:15	10:15
Break	10:15	10:30
ARC-IT Overview	10:30	12:00
Lunch	12:00	1:15
ARC-IT from... (2 perspectives)	1:15	1:45
Break	1:45	2:00
ARC-IT Tool Set Intro	2:00	2:30
ARC-IT Use in Planning/Projects	2:30	3:30
ARC-IT and ITS Security	3:30	4:15
Other Aspects of ARC-IT Website	4:15	4:30
Instructions for Day 2 and Adjourn	4:30	4:30



# ARC-IT v8 Workshop Agenda, day 2

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Topics – Day 2	Start	End
Welcome & Recap	9:00	9:15
Breakout Group Setup	9:15	9:30
Breakout Groups – RAD-IT and SET-IT	9:30	10:00
Break	10:00	10:30
Breakout Groups, continued	12:30	12:00
Lunch	12:00	1:15
Breakout Groups, continued	1:15	2:15
Break	2:15	2:30
Group Discussion on Lessons from Breakout Groups	2:30	3:00
ARC-IT and Tools Evolution	3:00	3:30
Wrap-up and Final Q&A	3:30	4:00
Adjourn	4:00	





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# INTRODUCTIONS

# Introductions

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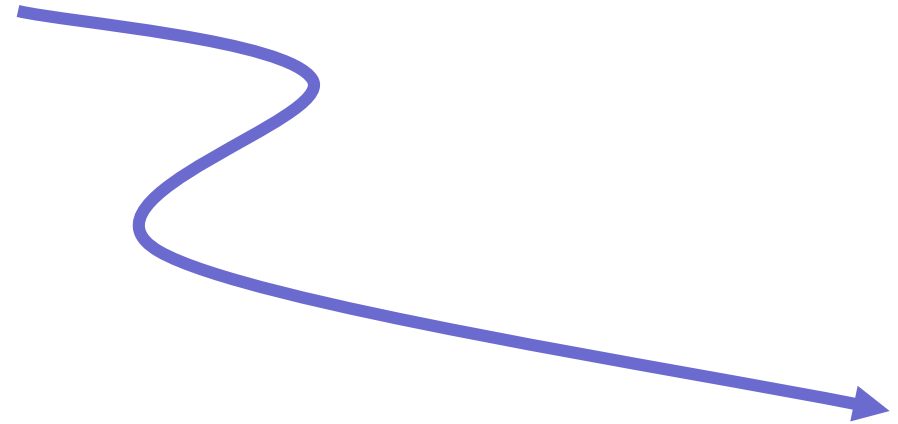
- Name
- Organization
- Previous ITS architecture experience
  - National
  - CVRIA
  - Regional
  - Project
- Expectations





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# BACKGROUND / HISTORY



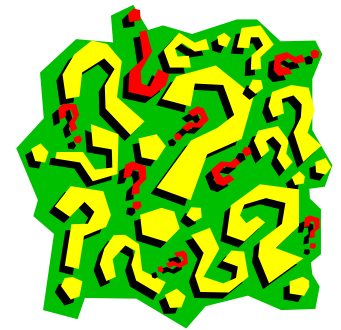
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# BACKGROUND / HISTORY – NATIONAL ITS ARCHITECTURE



# Why Have a National ITS Architecture?

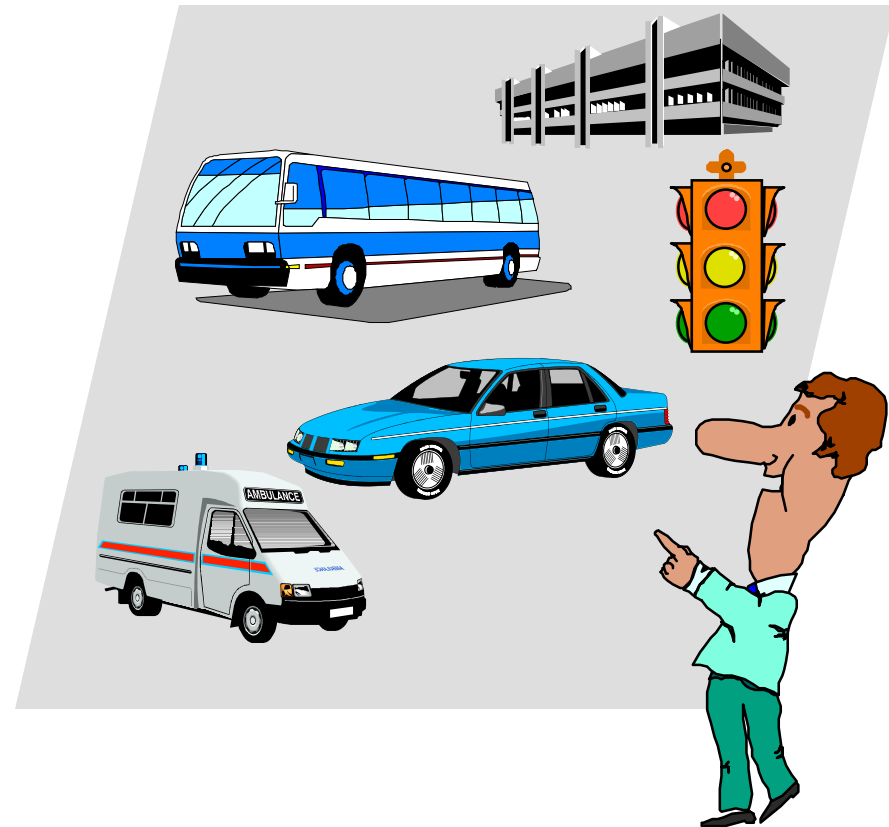
- Provide a National “Vision” for ITS
- Guide Sound ITS Planning and Investments at the State and Local Level
- Identify and Scope Need for ITS Standards



# US National ITS Architecture Provides a Framework to ...

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- Identify key stakeholders and interrelationships
- Describe required activities or functions
- Define interconnections and interdependencies between functions
- Develop a blueprint for integration of systems



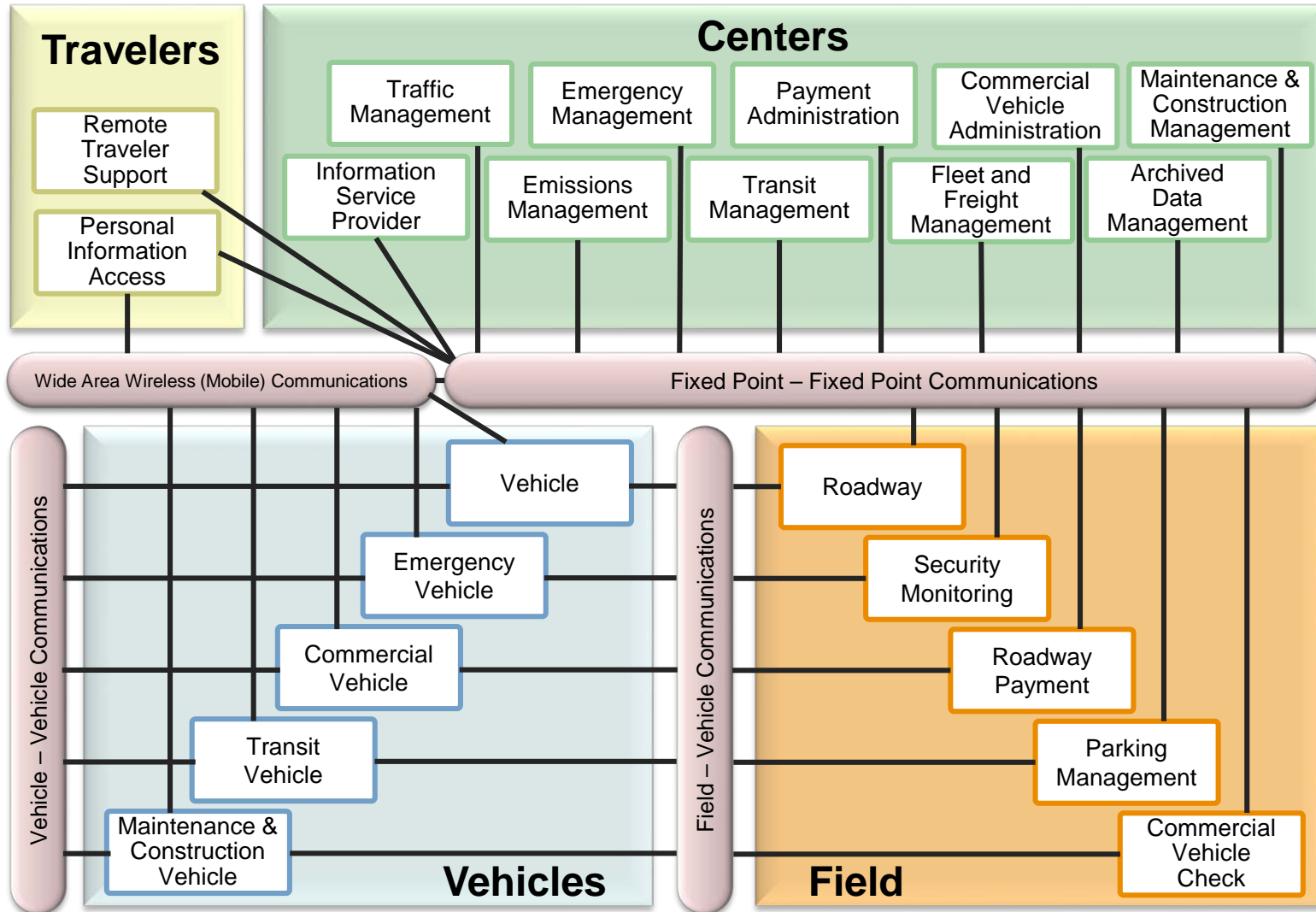
# What is the National ITS Architecture?

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- Congressionally mandated “blueprint” for federally funded ITS deployments
- Based on transportation related ‘User Services’
- Framework for integrating ITS systems, guiding deployment



# National ITS Architecture is a Framework and a Template

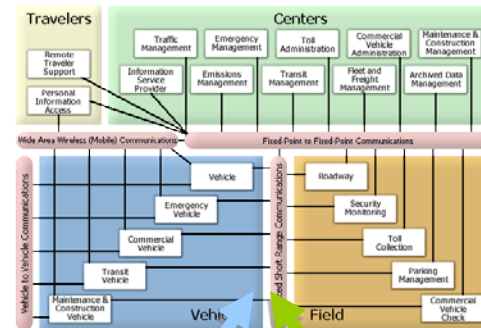




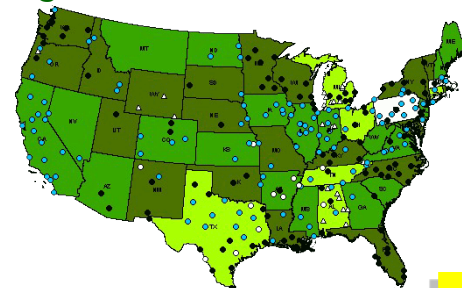
# Uses of the Architecture

- National ITS Architecture
  - Basis for Regional ITS Architectures
  - Framework for ITS Standards
- Architecture and Standards are Tools for Implementation
  - Incremental, Project by Project
  - Integrated
  - Interoperable
  - Cost-Effective

## National ITS Architecture



## Regional ITS Architectures



## ITS Standards

- IEEE 1512
- NTCIP
- ITE TMDD
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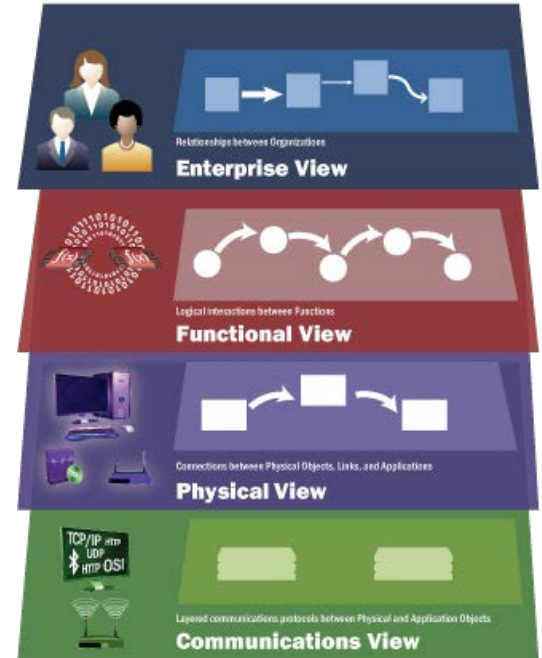


- ITS Projects
- Incremental
  - Integrated
  - Interoperable
  - Cost-Effective





Connected Vehicle Reference Implementation Architecture

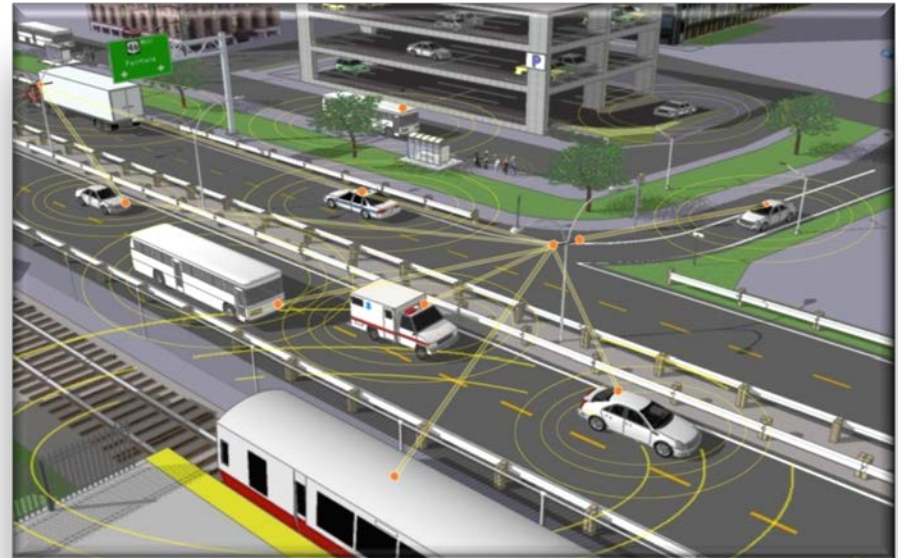


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# BACKGROUND / HISTORY – CVRIA

# Enabling Connected Vehicle Environment

- Communications Technology
  - Wide-Area Wireless Communication
  - Short Range Wireless Communication
  - Internet
- Institutional
  - Smart Devices (IoT)
  - Expectation of Connectivity
  - Privacy
  - Security

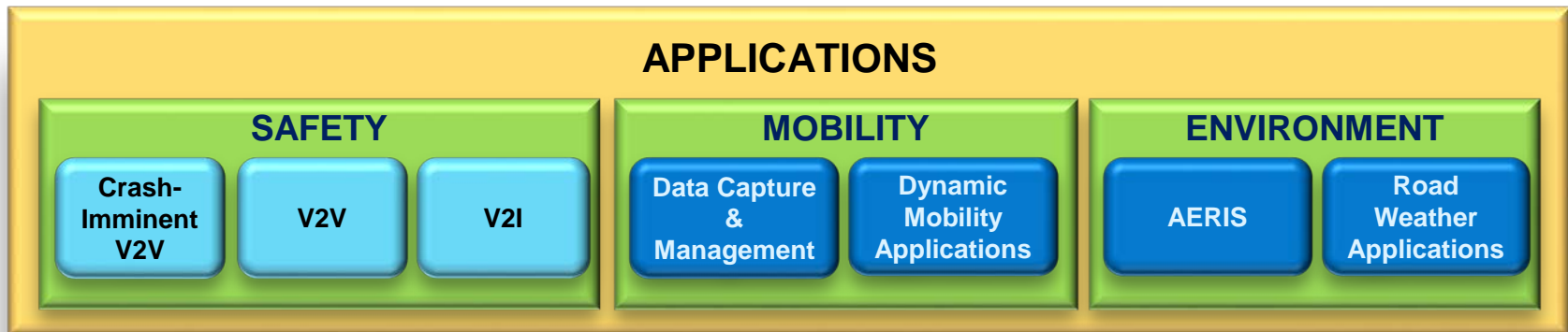




# We Need a Common Language

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- CVRIA is in response to managing the complexity of Connected Vehicle
- CVRIA models the Connected Vehicle functions and communications on a number of levels



# Purpose of CVRIA

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- To establish a framework for integrating connected vehicle applications & technologies to identify interfaces for standardization
- By...
  - Identifying connected vehicle needs/requirements
  - Developing a multi-faceted system architecture
  - Identifying and prioritizing candidate interfaces for standardization
  - Developing a toolset to support CV project design



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in four slides....

# SYSTEM ARCHITECTURE

(BASED ON ISO 42010, USED FOR CVRIA)



# System Architecture

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A System... has an Architecture

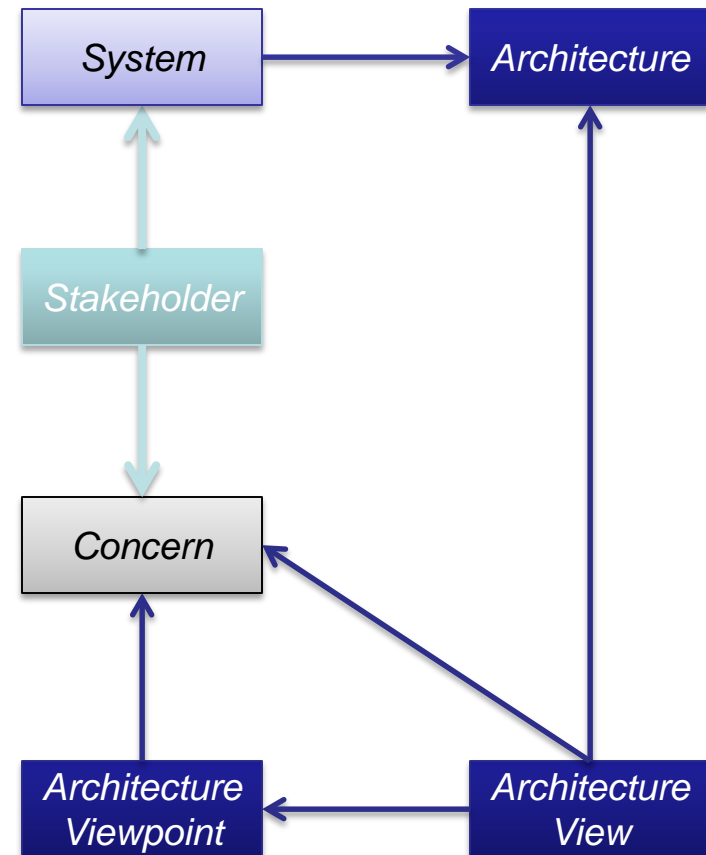
Stakeholders... have interests in the system

Stakeholders... have concerns

Architecture viewpoints... frame concerns

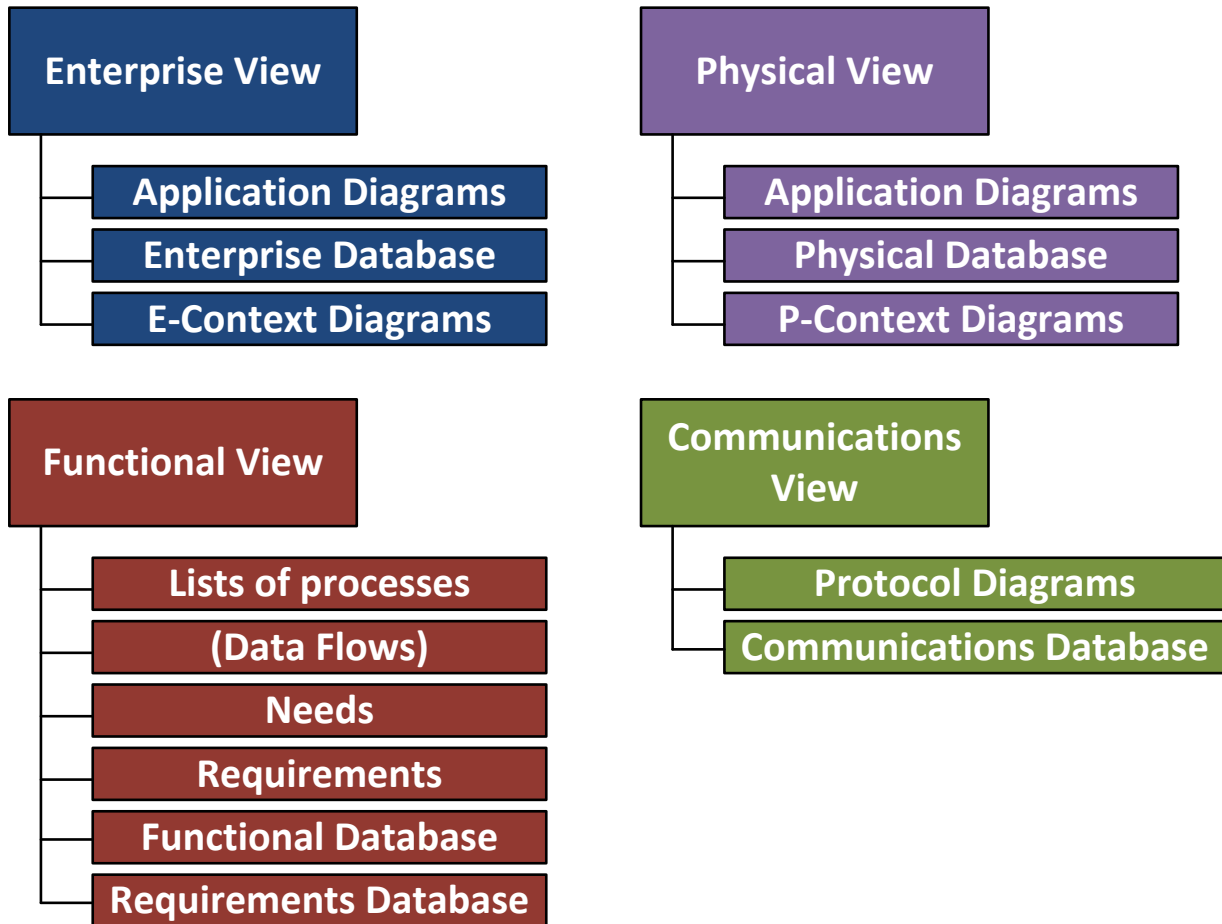
Architecture views... address concerns

The sum of architecture views make up the architecture



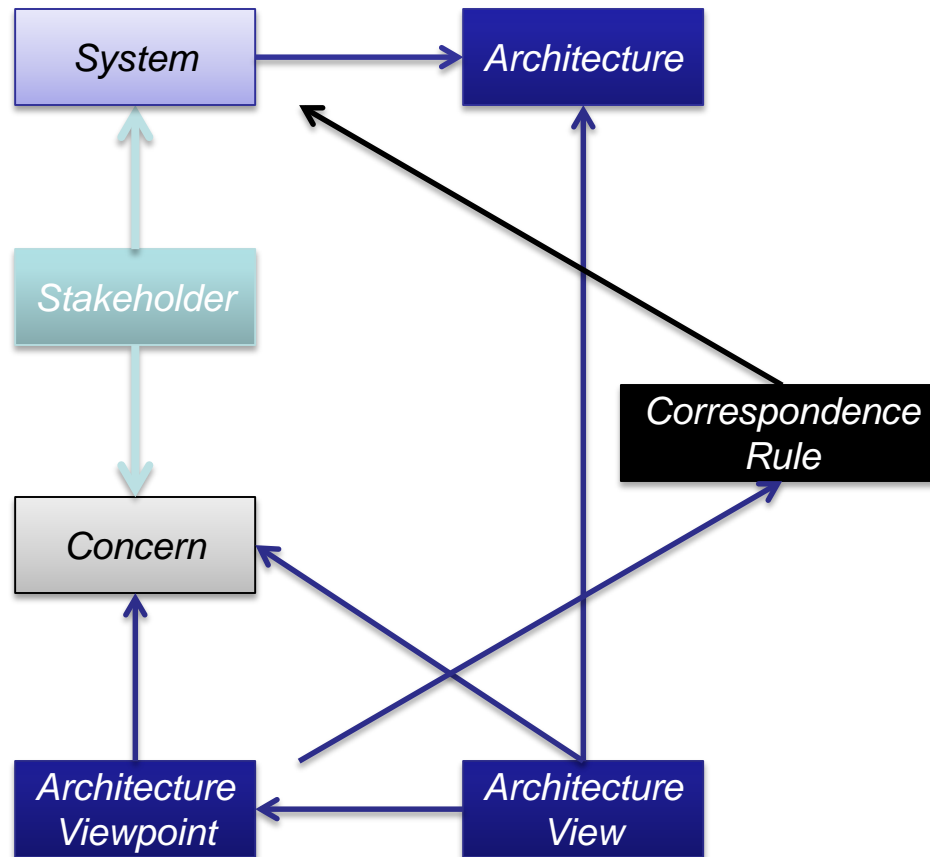
# CVRIA Viewpoints

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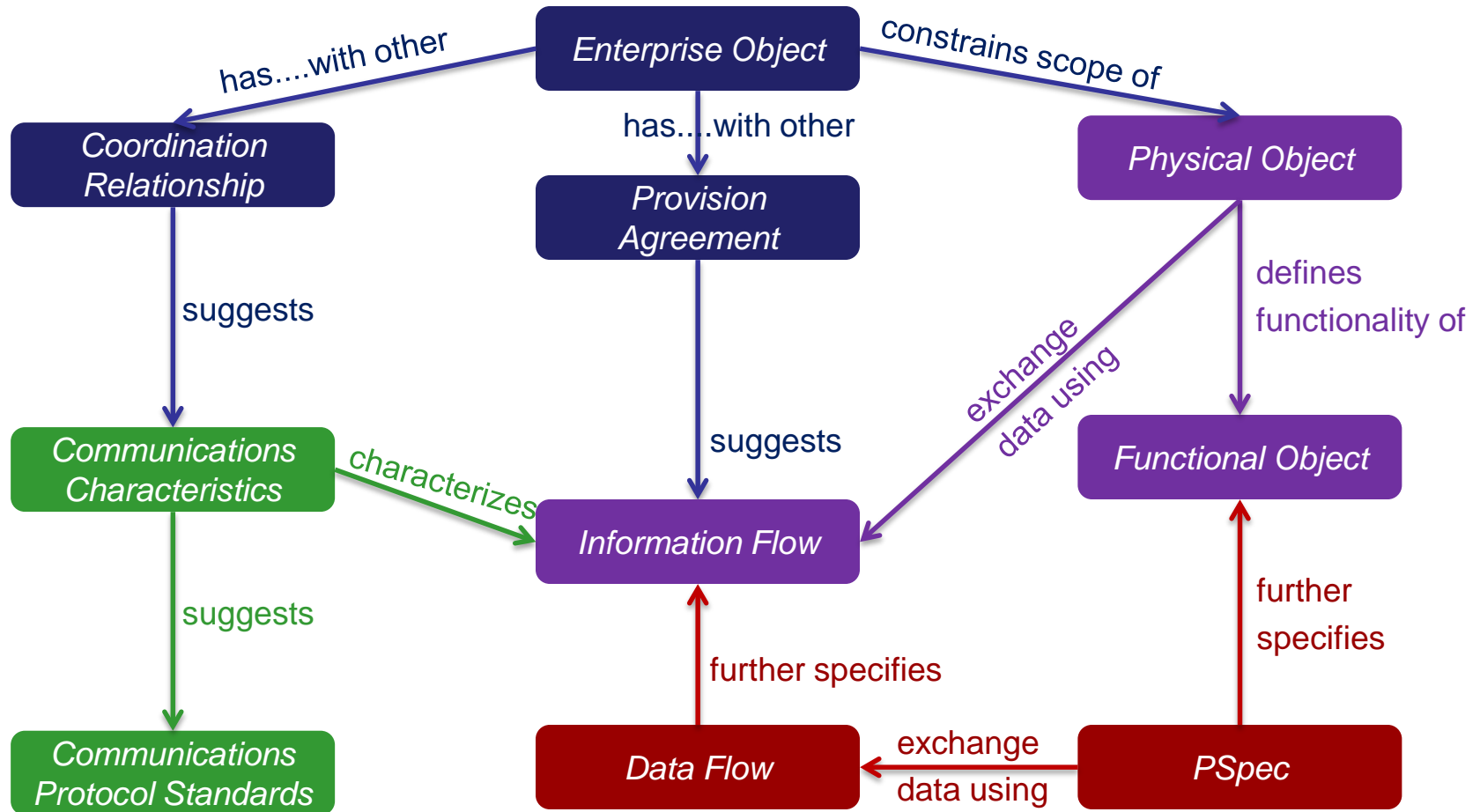


# CVRIA Viewpoint Correspondence

Correspondence rules define how artifacts in one viewpoint are related to artifacts in another.



# CVRIA Viewpoint Correspondence Cont'd



# CVRIA Website: [www.iteris.com/cvria](http://www.iteris.com/cvria)

## Connected Vehicle Reference Implementation Architecture

Welcome to the Connected Vehicle Reference Implementation Architecture (CVRIA) Website! This site is your tool for reviewing, providing feedback, and using the architecture content for standards and project development. CVRIA is being developed as the basis for identifying the key interfaces across the connected vehicle environment which will support further analysis to identify and prioritize standards development activities. CVRIA will also support policy considerations for certification, standards, core system implementation, and other elements of the connected vehicle environment.

As shown in the figure, CVRIA is developed in 4 Views:

- Enterprise - Describes the relationships between organizations and the roles those organizations play within the connected vehicle environment
- Functional - Describes abstract functional elements (processes) and their logical interactions (data flows) that satisfy the system requirements
- Physical - Describes physical objects (systems and devices) and their application objects as well as the high-level interfaces between those physical objects
- Communications - Describes the layered sets of communications protocols that are required to support communications among the physical objects that participate in the connected vehicle environment

Another way to view the architecture is from the perspective of the connected vehicle safety, mobility, environmental, and support applications. Each application page shows the subset of each of the views that pertain to that application.

The project is sponsored and led by the [USDOT's ITS JPO](#), under the management of the ITS Architecture and Standards Programs and in cooperation with the Systems Engineering and Test Bed Programs.

### Latest News

CVRIA has been updated to Version 2.0. This version includes updates to many of the original applications based on user feedback in areas like V2V Safety, V2I, transit, road weather, freight, public safety, environment, etc.. 2.0 also includes support for new applications from international users including Australia and the European Union. This version updates and expands the support applications including Security, System Monitoring, and Object Registration/Discovery. [Click here to see the details of What's changed in CVRIA 2.0!](#)

The Systems Engineering Tool for Intelligent Transportation (SET-IT) Version 2.0 is available as a download from the [Tools page](#). In addition to supporting all of the updated and newly added CVRIA applications, this version adds the ability to develop Communications View diagrams based on CVRIA. Version 2.0 includes a Search function, Spell Check utility, and Synchronize has been simplified and runs automatically. See the [Tools page](#) and [Readme file](#) for more details.

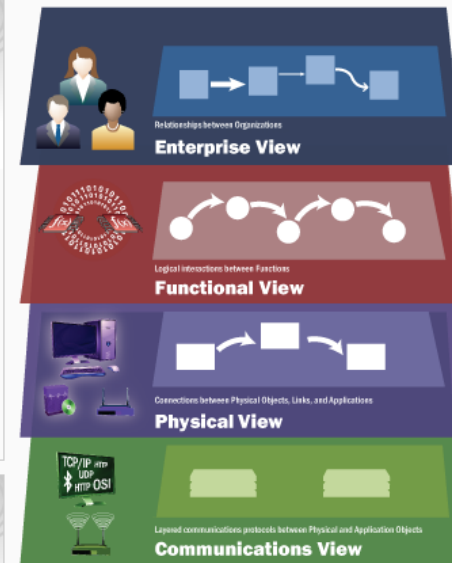
### Stakeholder Feedback

Feedback is encouraged as the CVRIA is developed and maintained. Key stakeholder activities include:

- Reviewing the architecture views
- Reviewing the standards development plan
- Providing inputs for policy development and review policy options

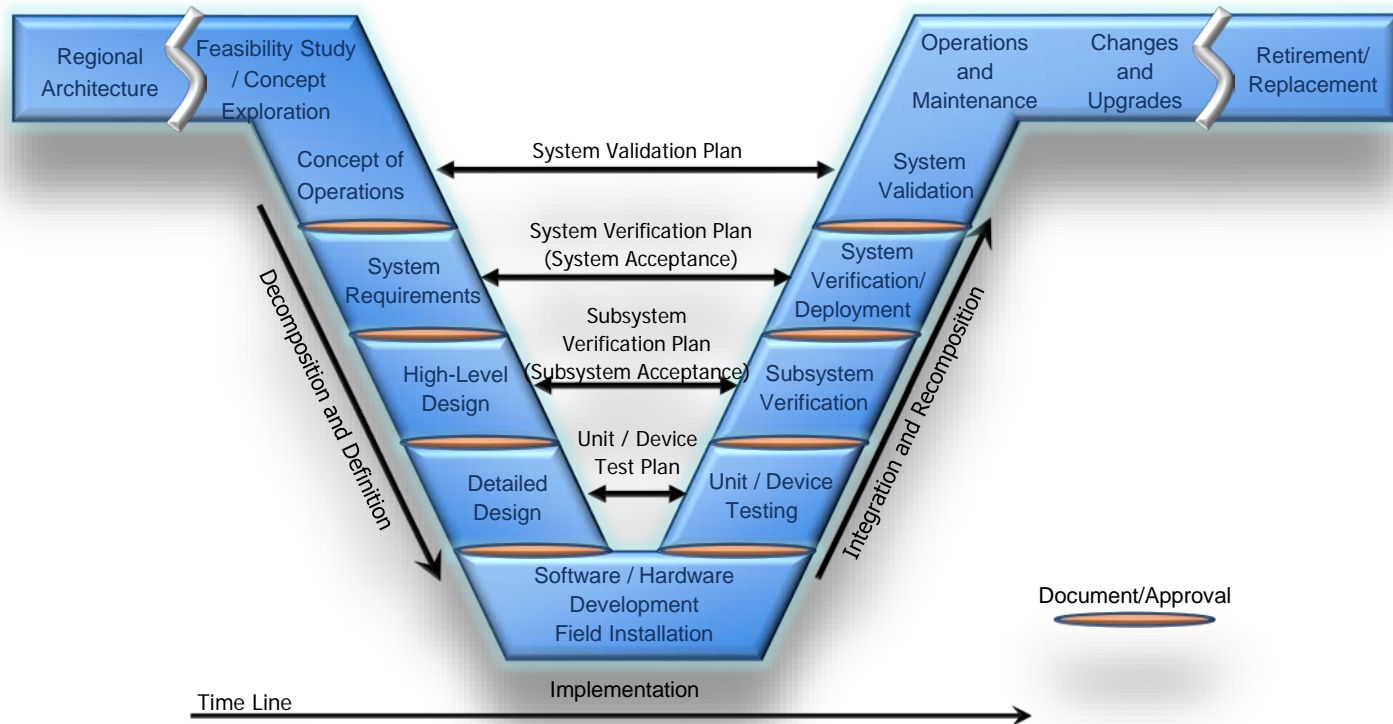
Please use the [Contact Us page](#) to ask questions or provide comments to the team.

Connected Vehicle Reference Implementation Architecture





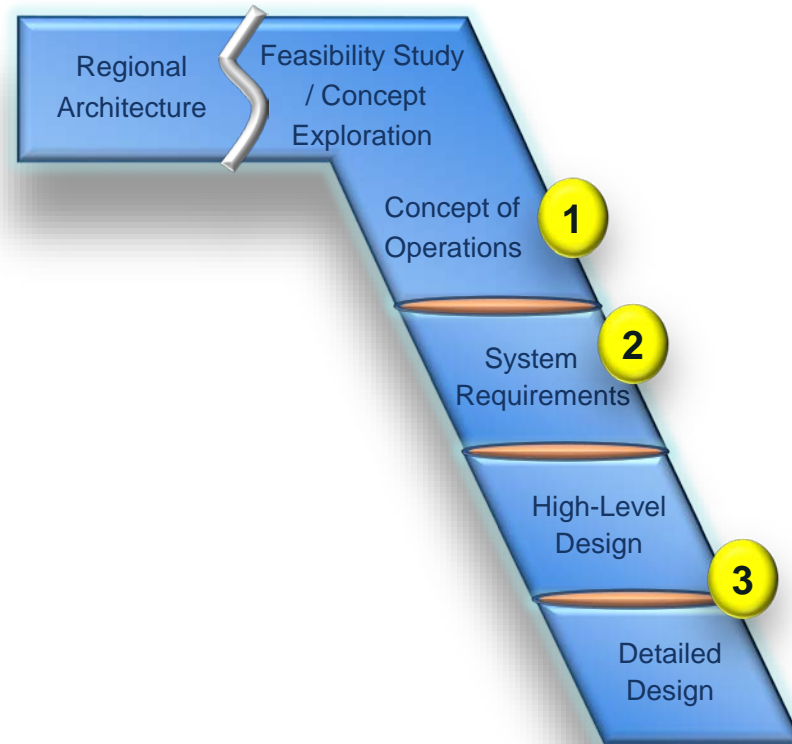
# Architecture and Systems Engineering



Architecture and Systems Engineering work together

# Architecture and Systems Engineering

- 1** Support development of concept of operations (ConOps)
- 2** Inform requirements
- 3** Inform design



Architecture tools like SET-IT aid in the definition of a project within the context of a common architecture to solve common problems

# Connected Vehicle Reference Implementation Architecture Uses

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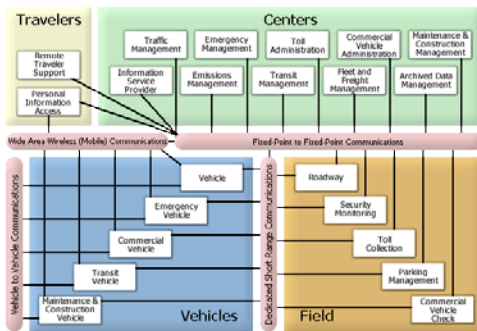
- Early CV deployments with ConOps, System Architecture
  - Southeast Michigan 2014
  - CV Pilots – New York City, Tampa, Wyoming
- Standards Harmonization
  - HTG6 – security credentials management
  - HTG7 – interface standards gaps



# History Has Led Us Here

- Both the National ITS Architecture and CVRIA continue to support needed activities in ITS
- Version 8 is the merging of both architectures to support all of the stakeholders' needs

## National ITS Architecture



Connected Vehicle Reference Implementation Architecture

