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CONNECTED VEHICLE REFERENCE IMPLEMENTATION ARCHITECTURE



SAFETY



MOBILITY



ENVIRONMENT

Over the past 10 years, the U.S. Department of Transportation (USDOT) has researched and developed connected vehicle technology, which allows vehicles to communicate with each other, roadway infrastructure, traffic management centers, and travelers' mobile devices. To ensure that this revolutionary technology is effective, the USDOT created the Connected Vehicle Reference Implementation Architecture (CVRIA), which establishes a framework for the integration and standardization of connected vehicle technologies.

CVRIA

The CVRIA forms the basis for a common language definition and early deployment concepts for connected vehicles. The architecture identifies key interfaces across the connected vehicle environment and informs standards development activities. The CVRIA and its associated Systems Engineering Tool for Intelligent Transportation (SET-IT) support and inform connected vehicle project development and integration activities.



Photo Source: USDOT

The CVRIA also supports policy considerations for certification, standards, core system implementation, and other elements of the connected vehicle environment.

The CVRIA project is sponsored and led by the USDOT's Intelligent Transportation Systems Joint Program Office (ITS JPO), under the management of the ITS Architecture and Standards programs, and in cooperation with the Systems Engineering and Test Bed programs.

CVRIA Updates

In July 2015, the ITS JPO released version 2.0 of the CVRIA. This version provides physical, functional, enterprise, and communication viewpoint enhancements. It also covers international applications being developed as the basis for identifying key interfaces across the connected vehicle environment. This will support further analysis to identify and prioritize standards development activities. As new technologies and ITS-based solutions evolve, it will be necessary to create new standards and/or refine existing standards. The ITS JPO is committed to developing and refining standards, as well as helping its partners understand and adjust to evolving standards.



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CVRIA Viewpoints

The CVRIA is a singular architecture composed of four viewpoints, each providing a different perspective to understand the architecture:

- **Enterprise:** Describes the relationships between organizations and the role that each organization plays 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), application objects, and the high-level interfaces between these physical objects
- **Communications:** Describes the layered sets of protocols that are required to support communications among the physical objects that participate in the connected vehicle environment.

SET-IT

SET-IT provides a single software tool that integrates drawing and database tools with the CVRIA enabling users to develop project architectures including customized physical, enterprise, and communications drawings and tables for pilots, test beds, and early deployments. This software is provided as-is, with no implied warranty. Additional functionality will be added in future versions.

Inputs to the Architecture

Several source documents were used as a baseline for developing the CVRIA, including concept of operations (ConOps) documents from connected vehicle applications, the core system ConOps, and existing standards. The existing National ITS Architecture and the Core System Architecture, along with existing international and domestic standards, were also used to develop the CVRIA. Applications and their supporting functionality were identified based on the various ongoing and completed ITS JPO research activities.

Application needs and requirements, if they were available in the source documents, were captured as inputs to the CVRIA. In some cases, needs or requirements were not developed, but important concepts and interfaces were identified. In those cases, needs and/or requirements were derived to support the architecture development.



CVRIA Maintenance

As new applications are conceived, interfaces are standardized, and systems are deployed, the lessons learned from those projects will feed back into the CVRIA to ensure that the connected vehicle environment is able to evolve and grow.

Now that the CVRIA has been established as a reference and has matured sufficiently, it will be incorporated into the National ITS Architecture (the framework for all of ITS) by the end of 2016 so that the interfaces and systems can be implemented consistently alongside traditional ITS projects.

For more information on the CVRIA, please visit:
www.iteris.com/cvria/index.html.

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