



Smart Roadside Initiative (SRI)

Smart Roadside Initiative

USDOT ITS Connected Vehicle Workshop



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September 26, 2012





Agenda

- SRI Background and Governing Efforts
- SRI Vision and Goals
- Project Team
- Technical Approach
- SRI Concept
- Task Detail: Task 5.1-5.2
- High-Level Project Schedule
- Completed, Current and Upcoming Activities





SRI Background

- What is Smart Roadside?
 - A joint modal initiative between Federal Highway Administration (FHWA) and Federal Motor Carrier Administration (FMCSA).
 - **Focus:** the development of roadside infrastructure for commercial vehicle operations that employs technologies for information sharing.
 - **USDOT vision:** demonstrate, evaluate, and deploy interoperable technology and improved data sharing to improve safety, security, operational efficiency, and mobility on the Nation's freight transportation system.
- Related Research:
 - Wireless Roadside Inspection Program
 - Universal Identification for CMVs
 - Electronic Screening/Virtual Weigh Stations
 - Truck Parking Program





SRI – USDOT Governing Efforts

- USDOT ITS Strategic Research Plan, 2010-2014; defines the strategic direction for the USDOT's ITS research program for the next five years.
 - Emphasis: **connected vehicle technologies and applications that uses wireless communications** to provide connectivity with and between vehicles; **between vehicles and roadway infrastructure**; and among vehicles, infrastructure and wireless consumer devices.
 - Areas: **safety, mobility**, environment
 - SRI represents research to improve safety and mobility of commercial vehicle operations.
- V2I:
 - Investigate key questions such as are vehicle based safety applications using V2I communications effective and do they have benefits
 - **SRI represents mode-specific research in this area with regards to commercial vehicles.**



SRI Vision and Goals

- Vision:
 - *Commercial vehicles, motor carriers, enforcement resources, highway facilities, intermodal facilities, toll facilities, and other nodes on the transportation system collect data for their own purposes and **share the data seamlessly with the relevant parties, in order to improve motor carrier safety, security, operational efficiency, and freight mobility.***
- Goals:
 - ***Build, install and test prototype of Smart Roadside Application(s)***
 - Enable data exchange between vehicle and roadside infrastructures which connect to authoritative databases for information and relevant data.

KEYS TO SUCCESS:

- ❖ Interoperable technologies
- ❖ Information sharing between vehicle-roadside-freight facility systems
- ❖ Leveraging current technology investments and existing partnerships
- ❖ Validating prototype needs, requirements and design with key stakeholders

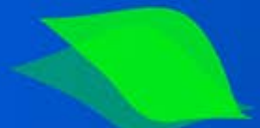
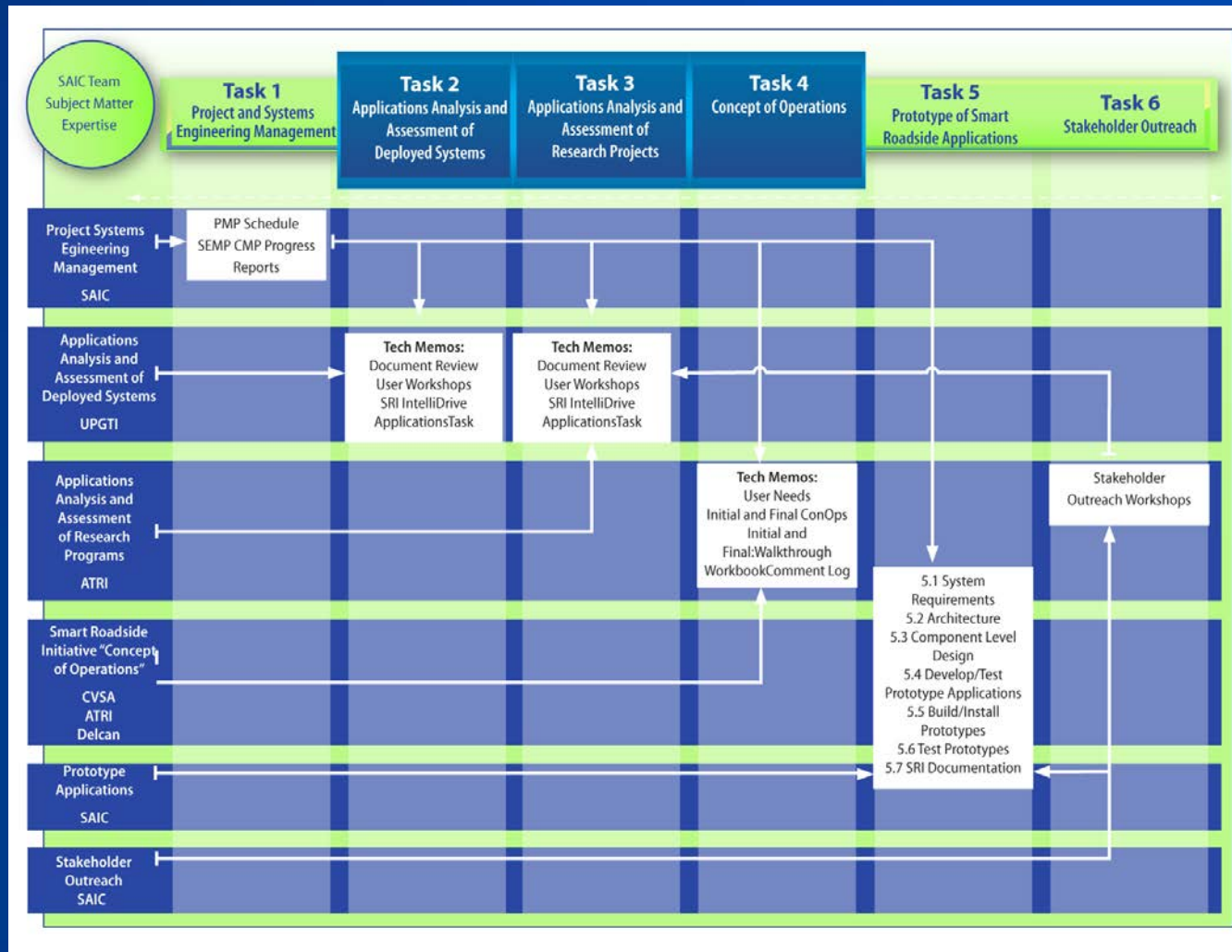


Project Team

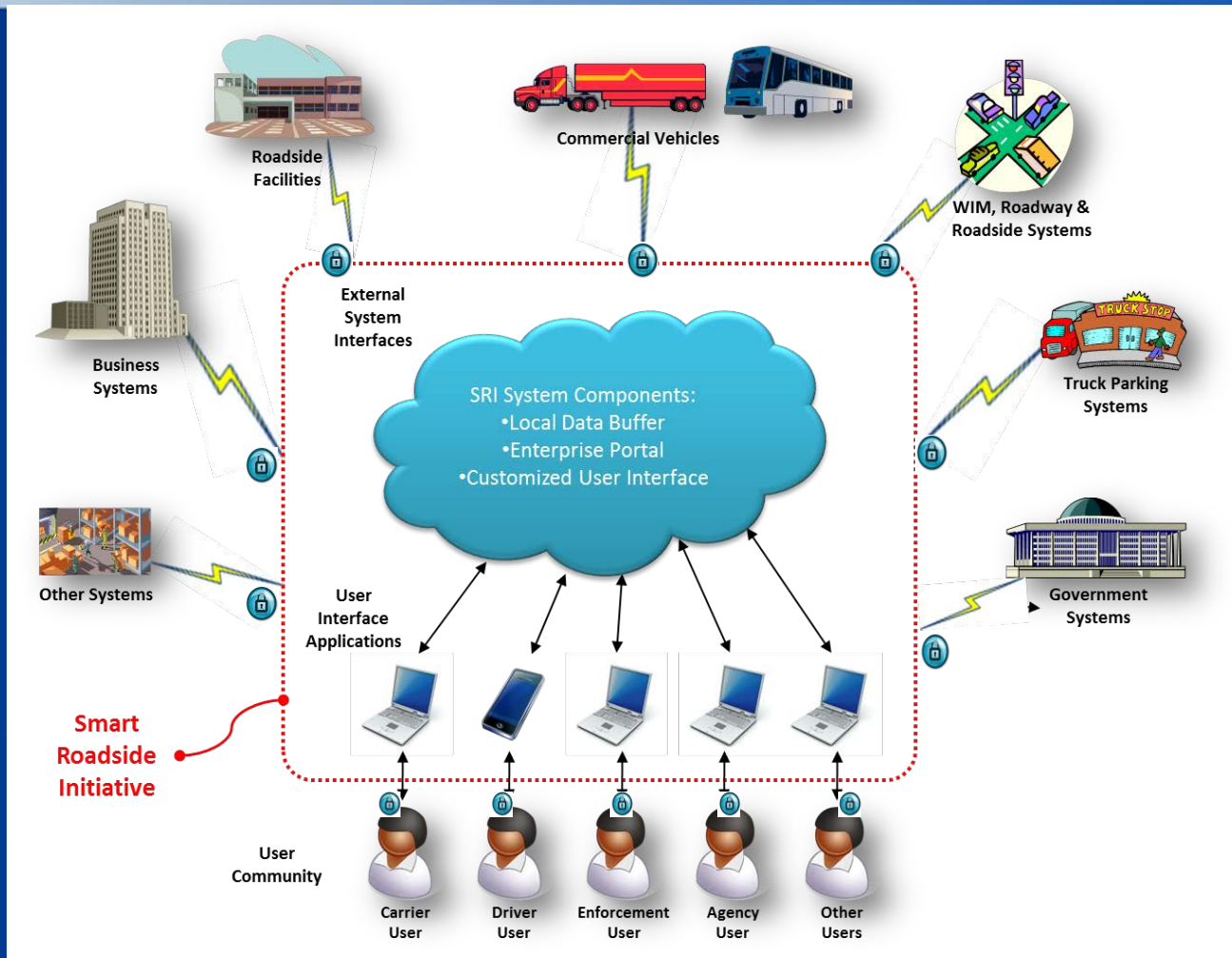
- **USDOT: ITS JPO, FHWA, FMCSA:**
 - Project Sponsor
- **SAIC**
 - Prime Contractor
 - Lead: project management, systems engineering, and prototype design, development, build, install and test
- **North Dakota State's Upper Great Plains Transportation Institute (UGPTI)**
 - Led applications analysis of deployed systems
 - Subject Matter Expertise for design
- **American Transportation Research Institute (ATRI)**
 - Led applications analysis of research projects
 - Technical advisor to project team representing the trucking industry
- **Delcan Corporation**
 - Led the development of the SRI Concept of Operations
- **Commercial Vehicle Safety Alliance (CVSA)**
 - Technical advisor to project team representing the commercial vehicle enforcement community



Technical Approach Overview



SRI Framework





SRI Overview

Elements

- Users: Industry and government users that would access the various capabilities delivered through the system
- User Interface Applications: Mechanisms by which users would request and receive information and forward instructions
- External System Interfaces: Linkages with the business and government systems that are needed to gain access to data and disseminate information

Task 2-3 Results: User Needs

ID #	User Need
UN01	The system needs to be able to identify Commercial Vehicle (CV) power units uniquely
UN02	The system must support the exchange of data between the CV and the roadside without requiring the vehicle to stop
UN03	The system must provide the ability to pass data collected from CV to external systems
UN04	The system must provide the ability to receive data from external systems
UN05	The system must provide the ability to efficiently and effectively exchange data between external systems and local users at the roadside or in the CV
UN06	The system must provide protection against unauthorized access to and use of data
UN07	The system must allow a vehicle operator to interact with it in a safe manner during vehicle operation
UN08	The system must be consistent with the ITS National Architecture and associated standards
UN09	The system must facilitate the integration of data from multiple sources into one or more cohesive, reusable datasets
UN010	The system must include functionality that meets specific CV operations needs (truck parking and enforcement screening applications)
UN011	The system must provide applications data in sufficient time to support decision making at the roadside
UN012	The system must be able to uniquely and reliably identify which commercial vehicle driver is actually operating a commercial vehicle
UN013	The system must be able to support the identification of trailing equipment pulled by uniquely identifiable CV power units
UN014	The system must operate in a V2X cooperative systems environment





Task 4 Concept of Operations

May 2012

- Identifies current system and shortcomings
- Future system concept and capabilities:
 - Identifying Entities on the Road
 - Sharing Information—establishing a common framework
 - Enhanced Electronic Screening—attended and unattended
 - Integrating Public- and Private-Sector Data
 - Streamlined/Accelerated Inspections—Wireless Roadside Inspections and traditional inspections
 - Performance-Based Standards and an Architecture
- Scenarios:
 - Compliant CMV (“Green Light”)
 - Compliant CMV – Os/Ow permit verification
 - Non-compliant CMV (“Red Light”)
 - Non-compliant CMV – illegal bypass
 - Real-time truck parking information system





Task 5 Overview

- Kickoff in May 2012
- Prototype Design, Build and Install:
 - System Requirements
 - Site Selection
 - Architecture
 - Component Level Design
 - Prototype Development and Test
 - Build and Install Prototype
 - Prototype Field Testing
 - Documentation





Task 5.1 System Requirements: Site Selections


- Process

- Survey Distribution (50 states)
- Inventory of current physical infrastructure, IT tools, communications infrastructure, physical layout and hardware.
- Evaluation of available infrastructure, availability for participation

- Candidates

- Alberta, Canada
- Colorado
- Maine
- Michigan
 - Connected Vehicle Test Bed
- Minnesota
- North Dakota
- New Jersey
- Pennsylvania
- Tennessee
- Florida





Task 5.1 – System Requirements

- Draft submission to USDOT – 8/10/12
 - USDOT comments: 8/31/12
 - Revision: 9/18/12
 - Walkthrough: tentative early October
 - Final SyRS: 10/29/12 or sooner
- IEEE 1233 compliant





Task 5.1 System Requirements - Details

- Categories:
 - System
 - Interface
 - Application
 - Performance
 - Security
- Additional Content:
 - Physical Requirements:
 - Environmental
 - Construction
 - Durability/Adaptability
 - Data Requirements
 - System Operations Specifications
- Traceability:
 - Unique identifier
 - Source
 - Verification method:
 - Test
 - Analysis
 - Demonstration
 - Inspection
 - Demonstration Location:
 - Michigan and/or Colorado
 - Future Site





Task 5.2 System Architecture

- Draft submission to USDOT – 8/10/12
 - USDOT comments: 8/31/12
 - Revision: 9/18/12
 - Walkthrough: tentative early October
 - Final SAD: 10/29/12 or sooner
- Sources:
 - Architecture Description Document, Version 1.1, 11/26/07 (Software Engineering Institute)
 - IEEE Recommended Practice for Architectural Description of Software-Intensive Systems (IEEE Std 1471-2000)



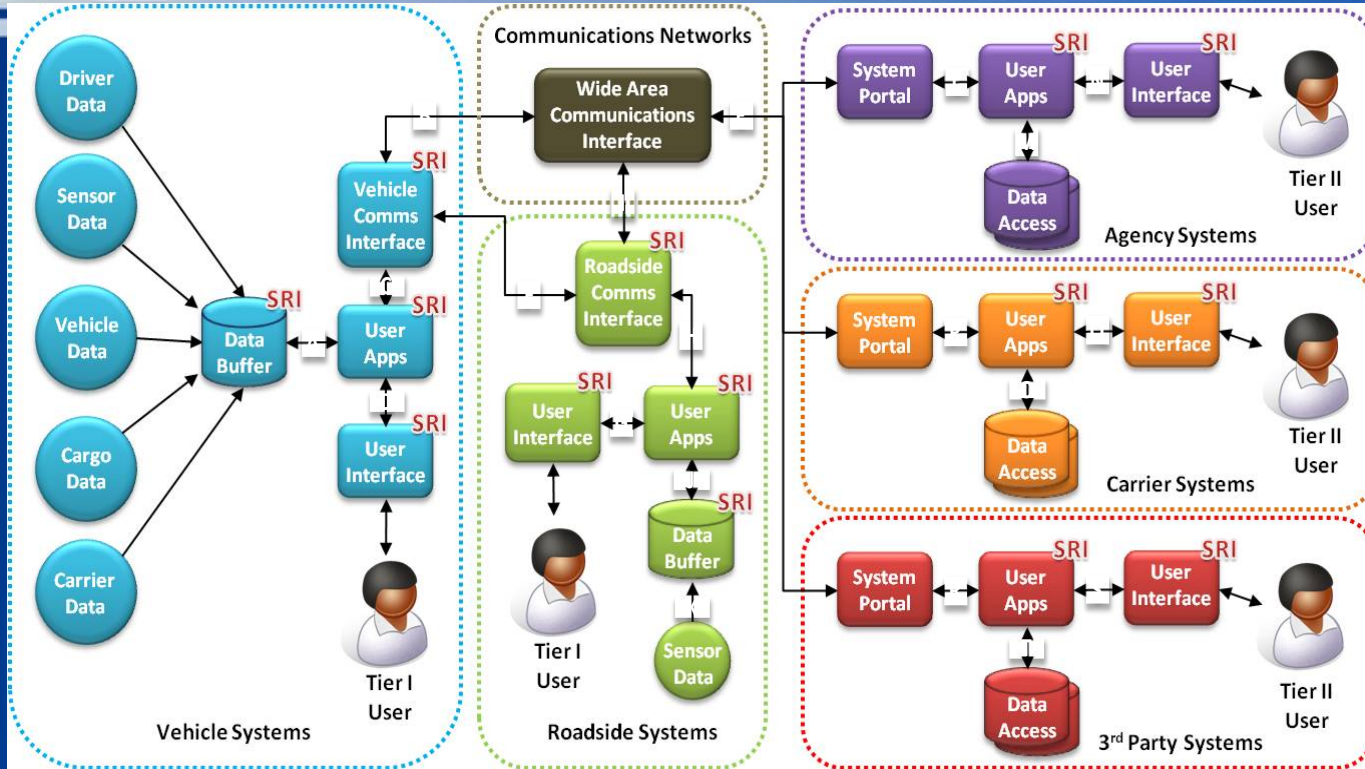


Task 5.2 System Architecture - Details

- Architecture decisions
- Operational and logical views
 - Operational elements
 - Software components
 - Information exchanges
- System views:
 - Components and relationships
- Technical views and technologies



Task 5.2 – Functional Architecture



A CAN (SAE J1939, 7pin, ...)

B Satellite, CMRS, CDPD, SAE J2735, IEEE P1609

C Serial (USB, RS232, RS485, ...), Bluetooth, Wi-Fi

D RGB, VGA, USB, HDMI, Bluetooth, Wi-Fi

E Ethernet, HTML, SOAP, Web-Services

F Wi-Fi, DSRC, Barcode, RFID, CAN, IR, OCR, Audio

G RGB, VGA, USB, HDMI, Bluetooth, Wi-Fi

H Serial, HDMI, Ethernet, Bluetooth, Wi-Fi

I Serial, Ethernet, Bluetooth, Wi-Fi, DSRC

J Serial, USB, Ethernet, Bluetooth, Wi-Fi

K Serial, Ethernet, Bluetooth, Wi-Fi, I²C

L Ethernet, HTML, SOAP, Web-Services

M SQL, Oracle

N Ethernet, HTML, SOAP, Web-Services, Browser

O SQL, Oracle

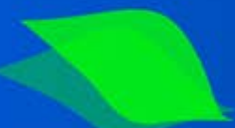
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R Ethernet, HTML, SOAP, Web-Services

S Ethernet, HTML, SOAP, Web-Services, Browser

T SQL, Oracle



Project Schedule

Activity	Completion Date
Project and Systems Engineering Management	Ongoing
Stakeholder Outreach	Ongoing
Applications Assessment of Deployed Systems	October 2011
Applications Assessment of Research Projects	October 2011
SRI Concept of Operations	May 2012
SRI System Requirements	October 2012
SRI System Architecture	October 2012
SRI Component-Level Design	February 2013
SRI Development and Testing	April – June 2013
SRI Build and Install	June 2013
SRI Prototype Testing	August - September 2013
SRI Final Documentation	December 2013





Completed Activities

- ✓ Project Management Plan
- ✓ Systems Engineering Master Schedule
- ✓ Systems Engineering Management Plan
- ✓ Configuration Management Plan
- ✓ Task 2-3 Tech Memo 1: Documentation Review
- ✓ Task 2-3 Tech Memo 2: User Needs
- ✓ Task 2-3 Tech Memo 3: Prioritization of Applications
- ✓ Task 4: Draft ConOps
- ✓ Task 4: ConOps Walkthroughs
- ✓ Stakeholder Engagement:
 - ✓ Reviews of user needs, operational policies, operational constraints



Current and Upcoming Activities

- Current Activities
 - Scheduling and preparing SyRS and SAD walkthroughs
- Upcoming Activities:
 - SyRS and SAD walkthroughs
 - SyRS and SAD Final versions
 - Kickoff SRI system design



Points of Contact

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