Day 2: Overcoming Challenges in Concept Development, USDOT Introduction

Kate Hartman, ITS JPO, CV Pilots Program Manager
Objectives of Day 2

- Provide sites with the USDOT perspective on CV technology deployment, oriented by CV Deployment Site Phase 1 Deliverables
  - Organized by key topic (may be more than one topic per task)
  - Review of what the BAA direction in this area
  - Assessment of how this topic may influence multiple tasks/deliverables
  - Provide quick survey of relevant background materials
  - Note top challenges
  - Identify references and potential forms of USDOT technical assistance

Objective:
- Help sites to consider where help is most needed – and to direct USDOT technical assistance resources to these areas

Our Tactics For Today:
- USDOT will track issues/challenges, but our schedule does not allow for long technical discussions
- Issues/challenges list brought to first bi-weekly meeting for disposition
OVERVIEW OF AGENDA

- Walkthrough Tasks 1-13 in order

- In each Task, address one or more topic areas
  - USDOT provides 10-15 minutes of perspective in each topic area
  - Structured Q&A for 10-15 minutes for each task
    (might cover multiple topics, so remember your questions!)

- For each topic area, USDOT has provided:
  - A copy of the slide deck and/or a white paper
  - White papers provide additional guidance and detail that cannot be covered in a short briefing

These documents do not replace or alter the work statement defined in the Broad Agency Announcement; rather it provides technical guidance to the pilot deployers in completing the tasks and deliverables described in the statement of work.
Deliverables are highly interdependent

- Integrating USDOT-identified task interdependencies creates this diagram....

- Stovepipe approach by task is NOT recommended
KEEPING ON TRACK

- **Our agenda today is packed, we cannot permit long digressions**
  - Clarifications are OK
  - More complex issues will be surfaced and noted to be dealt with off-line

- **Everyone should consider this kickoff as an informal working meeting**
  - Breaks are limited
  - Lunches are not provided, please get lunch and bring it back
  - Participants should come and go as they need to do so

- **Moderators will ensure that we stay on schedule in our agenda**
  - This may mean that some slides will not be briefed (but you have them)

- **The key take-away from today**
  - *identifying issues and challenges and*
  - *how to get help on a key issue through your COR,*
  - *not how to resolve the issue.*
GROUND RULES

- We will stay on schedule, this may mean deferring detailed discussions

- USDOT speakers are aware they need to deliver material in time allotted

- We will moderate questions to ensure sites have equal opportunity to ask questions
  - However, some issues will have to be taken off-line for resolution
  - USDOT team members/contractor staff will track these issues

OK? Let’s get started!
RELEVANT DELIVERABLES

Task 1: Project Management Plan (Draft and Final)

*Describes the activities required to perform the work described in all identified Concept Development task areas and includes a detailed Concept Development Project Schedule.*

Task 1: Monthly Progress Reports

*Identifies all deliverables and deliverable status (not initiated, in progress X% complete, draft delivered, in revision X% complete, final delivered, accepted) as well as an updated Project Schedule.*

The influence of the Project Management Plan should be reflected in other deliverables...

The diagram illustrates the interconnection of various tasks, starting with Task 1: Project Management Plan (PMP) and leading to other tasks such as Task 2: ConOps, Task 3: Privacy and Security Operating Concept, Task 4: Safety Plan, Task 5: Performance Measurement, Task 6: SyRS, Task 7: Application Deployment Plan, Task 8: Human Use Approval Summary, Task 9: Training, Task 10: Outreach Plan, Task 11: Deployment Readiness, Task 12: Deployment Plan, and Task 13: Partnerships. The diagram clearly shows the phase timelines from 0 to 12 months, with Project Management-related elements marked in orange.
**PROJECT MANAGEMENT PLAN**

- **Required Elements**

- **Project Schedule**
  - The Concept Development Project Schedule should list all activities required to bring all required work to a successful completion
  - At minimum, three levels of the Work Breakdown Structure.
  - The Project Schedule should be updated monthly and delivered with the Monthly Progress Report.

- **Status Meetings with USDOT**
  - USDOT suggests a weekly or bi-weekly site-specific bi-lateral status meetings to surface issues, track risks and take coordinated action (frequency of these meetings per the Communications Plan)
MONTHLY REPORTING

- What deliverables are required to be tracked?
  - Only the top level deliverables identified in the BAA
  - Draft and Finals should be treated as different deliverables

- Calculating Percent Complete
  - Estimated each month, based on work performed

- Narratives (one paragraph summaries in each area)
  - Schedule Risk
  - Technical Risk
  - Partnership Risk
  - Retrospective Costs/Cost-To-Complete
    - USDOT is interested in actual costs to assist/guide later deployers
KEY REFERENCES


- USDOT Program Management Templates
  http://www.its.dot.gov/project_mang/index.htm
  - Schedule and Monthly Status Report
  - Risk Register
  - Communications Plan
TECHNICAL SUPPORT SUMMARY

- Proposed CV Pilots Project Management Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>Kickoff Meetings</td>
<td>9/30-10/1/2015</td>
</tr>
<tr>
<td>Bi-Weekly Coordination Teleconferences</td>
<td>TBD</td>
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</table>

- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the project management lead Kate Hartman
The ConOps shall refine the set of proposed high-priority needs through structured stakeholder interaction, rigorously define a set of key performance measures and identify associated quantitative performance targets for each performance measure that are achievable within the time frame of the Pilot Deployment.

The ConOps shall describe the specific combination of applications to be deployed in the Pilot Deployment, and how operational practice will be altered based on the introduction of these applications.

The influence of the ConOps should be reflected in other deliverables…
WHAT IS A CONCEPT OF OPERATIONS?

- High-level identification of user needs and system capabilities in terms that all project stakeholders can understand
- Stakeholder agreement on interrelationships and roles and responsibilities for the system
- Shared understanding by system owners, operators, maintainers, and developers on the who, what, why, where, and how of the system
- Agreement on key performance measures and a basic plan for how the system will be validated at the end of project development

The context diagram shows the set of physical objects expected in the deployed pilot deployment system and high-level data exchanges expected among system objects. Text supporting the diagram shall detail all assumptions made and catalog any/all uncertainties in these assumptions. This diagram does not replace or define system architecture or system design. It is intended only to provide context for the ConOps in the elicitation of needs and to surface ambiguities or uncertainties associated relevant to ConOps development.
CONOPS CHALLENGES

- **Complicated Task**
  - Issue: Deriving a concept of Operations is multilayered task requiring input from many systems.
  - Possible Strategy: Get an experienced Systems Engineer involved from the start of the project who has a background in large project deployments.

- **Problem Based**
  - Issue: What is the problem I am trying to solve?
  - Possible Strategy: Don’t get involved in the design too soon. First ask the question: “What is the problem I am trying to solve?”, and write the ConOps to solve the problem in every step.

- **Input from Stakeholders**
  - Issue: How do I know which problem is the most important?
  - Possible Strategy: Involve stakeholders from a representative cross-section of the users of the system. What do they believe needs to be solved?
### Key References


**TECHNICAL SUPPORT SUMMARY: CONOPS**

- Proposed CV Pilots Concept of Operations Events

<table>
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<th>Schedule Item</th>
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<tr>
<td>Reference Architecture Boot Camp</td>
<td>Award + 3 weeks</td>
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<tr>
<td>Bi-Weekly Systems Engineering Round-Tables</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on Concept of Operations*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the Concept of Operations lead Walt Fehr
CONNECTED VEHICLE PILOT
Deployment Program

Security Operational Concept

Kevin Gay, Program Manager, NHTSA
**RELEVANT DELIVERABLES**

**Task 3: Security Management Operating Concept (Draft and Final)**
Describes the underlying needs of the Pilot Deployment to protect the privacy of users, ensure secure operations, and outline a concept that addresses these needs.

*For each individual proposed application, and for the system as a whole, the Contractor shall address the needs, if any, for confidentiality, availability, integrity, authenticity and non-repudiation… The Privacy and Security Operating Concept shall describe, at a high level, the concepts to be implemented to meet system security and privacy needs.*

*The influence of the PSMOC should be reflected in other deliverables…*
SCOPE OF SECURITY OPERATIONAL CONCEPT (1)

- Identify needs for each object and information flow supporting the application and system, based on information flows. NIST guidance defines low, medium, and high levels impact categories for:
  - Confidentiality – allowing only authorized access, includes protection of personal privacy and proprietary information
  - Integrity – includes non-repudiation and authentication, as well as content accuracy and preventing unauthorized modification
  - Availability – timely and reliable access

- Consider security threats:
  - Intentional threats: both internal and external
  - Accidental threats: both internal and external
  - Acts of nature

- Select security mechanisms based on impact categories and threats
  - NIST guidance (Security and Privacy Controls for Federal Information Systems and Organizations) identifies 17 areas to consider
The SCMS is a required tool which supports a subset of security mechanisms:

- Provides enrollment certificates that can be used for signing and/or encrypting communications to the SCMS (to support both confidentiality and integrity, including authentication)
- Provides pseudonym certificates that can be used for signing BSMs and other messages broadcast over DSRC (ensures trust)
  - By design, pseudonym certificates can’t be used to uniquely identify a device or a user

…”the proposed pilot shall utilize the SCMS for at least one of the proposed applications, and all applications where utilizing the SCMS is deemed appropriate (e.g., applications where trust and security are essential.”
SECURITY CHALLENGES

- **SCMS Integration**
  - Issue: SCMS is being developed in parallel with CV Pilot planning phase. Interface protocols for communicating with the SCMS will be shared with the CV Pilot sites.
  - Possible Strategies: Closely monitor release of SCMS documentation, assess where SCMS best fits within your plans.

- **System of systems**
  - Issue: Not all systems are under the control of the CV Pilot team.
  - Possible Strategy: Understand the extent and limitations of security of federated systems, implement appropriate boundary security and internal audits.

- **Payments processing (if applicable)**
  - Issue: Introduces additional complexities: PII, required identification, non-repudiation.
  - Possible Strategies: All data collection needs to be justified and protected. Payment card industry has their own standards that must be followed.
3 Internal SCMS Releases
- Feb 2016, March, 2016, and June 2016

Final Documentation Delivered at Project End
- Includes requirements, design, test, and code
- Does not include hardware
KEY REFERENCES

- **Assessment of V2I Cyber Security, Threat Definition Based on V2I Architecture, Development of Security Controls**, Forthcoming USDOT reports, expected on or before 31 November 2015.

- Note: FIPS PUBS and NIST Special Publications provide invaluable guides for use by state and local governments as well as the private sector, but their use is not mandatory for non-Federal systems.
TECHNICAL SUPPORT SUMMARY: SECURITY

- Proposed CV Pilots Security Considerations Events

<table>
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<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>SCMS Webinars</td>
<td>Up to 2, dates TBD</td>
</tr>
<tr>
<td>Security Round-tables</td>
<td>Up to 2, dates TBD</td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on Security Operational Concept*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the security lead, Kevin Gay
CONNECTED VEHICLE PILOT Deployment Program

Data Privacy Protection

Edward Fok, Transportation Technologies Specialist

ITS Joint Program Office
**RELEVANT DELIVERABLES**

**Task 3: Privacy and Security Management Operating Concept (PSMOC)**

Describes the requirement that all CV Pilot Deployment Sites develop and institute appropriate security and privacy controls to ensure appropriate collection and handling of PII/SPII.

*The Privacy and Security Management Operating Concept shall describe, at a high level, the privacy and security risk from the system and business practices, and how these risks will be managed and mitigated.*

*The PSMOC is driven by the overall Concept of Operations and the privacy Operating Concept will be reflected in other deliverables.*
OVERARCHING CONCEPTS

- **Personally Identifiable Information (PII):**
  - information that can be used to distinguish or trace an individual’s identity, such as their name, Social Security number, biometric records, etc., alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother’s maiden name, etc.

- **Sensitive Personally Identifiable Information (SPII):**
  - A subset of PII which if lost, compromised or disclosed without authorization, could result in substantial harm, embarrassment, inconvenience, or unfairness to an individual Social Security number (SSN), Passport number and Driver’s license number are always SPII. These requires stricter handling guidelines because of the increased harm to an individual if the data are disclosed.

- In the CV Pilot context, PII/SPII can include, but not limited to, participant recruitment, payment and research data, GPS data, drivers license information.
CV Pilot site must institute security and privacy controls that are commensurate with the harm to individuals that could result from unauthorized use or disclosure of PII/SPII. Examples of such controls can include:

- SPII must be encrypted in transit and at rest
- Research data should be separated from participant name, address, contact, recruitment and payment information

Federal Privacy laws and Policies will apply to Federally contracted PII/SPII collections

- USDOT will provide detailed guidance on required assessments and controls in webinars and roundtables
- USDOT will provide Guidelines/Best Practices to minimize privacy risks stemming from the activities of State and Local Agencies operating independently of Federal Contracts
TECHNICAL SUPPORT SUMMARY: PRIVACY

- Proposed CV Pilots Privacy Protection Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>Privacy Webinar</td>
<td>TBD</td>
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<tr>
<td>Privacy Round-tables</td>
<td>TBD</td>
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- Updated Privacy White Paper being reviewed
  - Consistent with Federal Law and Regulation
  - Consistent with NHTSA’s NPRM
  - Planned availability by November 2015 or earlier
CONNECTED VEHICLE PILOT
Deployment Program

Safety Management Plan

John Harding, Intelligent Technologies Research, NHTSA
Task 4: Safety Management Plan (Draft and Final)
Describe Safety Scenarios related to the applications and technologies selected for the Pilot Deployment and develop a Safety Operational Concept that describes the actions expected to be taken within the deployment to reduce the likelihood and potential impact in each safety scenario.

The Safety Management Plan shall describe the underlying safety needs associated with the safety of all travelers, subjects, and other personnel associated with the Pilot Deployment.

Safety Management Plan is not Safety Evaluation

- Safety Evaluation
  - Included in the Performance Measurement and Evaluation Task (Task 5) to evaluate the safety impacts/benefits

- Safety Management Plan
  - To define approaches/processes for the identification and management/minimization of the inherent safety risks associated with the Pilot Deployment.
RELEVANT DELIVERABLES

The influence of the Safety Management Plan should be reflected in other deliverables...

Task 2: ConOps
Task 3: Privacy and Security Operating Concept
Task 4: Safety Plan
Task 6: SyRS
Task 7: Application Deployment Plan
Task 9: Training
Task 8: Human Use Approval
Task 12: Deployment Plan

Phase 1 - Months
0 3 6 9 12

- Safety Elements
SAFETY PLAN DEVELOPMENT PROCESS

- **Process**
  - **Safety Scenarios**
    - System Level
    - Application Level
  - **Risk Assessment**
    - High/Medium Risk
    - Low/No Risk
  - **Safety Operational Concept**
    - Functional Safety Requirements
    - Safety Management
    - Standard Response/Backup Plan

- **Examples**
  - **Safety Scenario**
    - System level: Power outages, communication failures, system hacks, unexpected events
    - Application Level: Hazardous product delivery, Pedestrian crossing detectors malfunction
  - **Risk Assessment Approach**
    - ISO 26262 ASIL (Safety Pilot) or other approaches
  - **Safety Operational Concept**
    - Functional Safety Requirements: Requirements to ensure safe operation of the application
    - Safety Management: Incorporation of safety from concept development to monitoring operations
    - Standard Response: Local emergency response procedure (e.g., Emergency Transportation Operations), Hazardous Materials/Dangerous Goods Regulations
    - Backup Plan: Back to pre-deployment status (shutdown deployment), a backup detection/warning system
SAFETY CHALLENGES

- **Risk Assessment**
  - **Issue:** Overestimate/underestimate the risk
  - **Possible Strategy:** Identify different level of risk using risk assessment approach

- **Site-Specific Safety Plan**
  - **Issue:** Safety scenarios vary depending on deployment sites/applications selected
  - **Possible Strategy:** Develop a site-specific safety plan

- **Local Support**
  - **Issue:** Coordinate with various local emergency response agencies
  - **Possible Strategy:** A safety manager coordinating and executing the procedure

- **Reaction of Participants**
  - **Issue:** Participants are not aware of the safety scenarios and the corresponding responses
  - **Possible Strategy:** Include in the training plan
KEY REFERENCES

- International Organization for Standardization, *ISO 26262 Road Vehicles - Functional Safety*
  

- USDOT, NHTSA, Integrated Vehicle-Based Safety Systems Preliminary Field Operational Test Plan (DOT HS 811 010), August 2008
  

  

  

  
TECHNICAL SUPPORT SUMMARY: SAFETY

- Proposed CV Pilots Safety Management Events

<table>
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<tr>
<td>Webinar for Safety Management Task (30 min)</td>
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<tr>
<td>- Detailed walkthrough of the Safety Guidance</td>
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<td>- Q&amp;A</td>
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<td>Safety Call Part 1 (30 min)</td>
<td>Award + 16 weeks</td>
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<tr>
<td>- Site update on Safety Plan</td>
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<tr>
<td>- Q&amp;A</td>
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<tr>
<td>Safety Call Part 2 (30 min)</td>
<td>Award + 20 Weeks</td>
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<tr>
<td>- Site update on Safety Plan</td>
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<tr>
<td>- Q&amp;A</td>
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</tbody>
</table>

- Read the Guidance Summary on Safety Management Plan
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the safety lead John Harding
RELEVANT DELIVERABLES

Task 5: Performance Measurement and Evaluation Support (Draft, Final, Webinar)
Describes a plan to monitor and measure quantitative and qualitative performance measures, mitigate impacts of confounding factors, generate use cases/scenarios with most impact, and record action logs.

The ability to capture and analyze observed data to monitor performance over time must be considered as a key requirement of the pilot deployment.

The Contractor shall develop a plan to ensure quantitative performance measurement against identified targets is embedded as a core pilot deployment capability.

Development of the Performance Measurement Plan is influenced by or influences other deliverables...

Task 5: Performance Measurement
Task 2: ConOps
Task 3: Privacy Considerations
Task 6: SyRS
Task 9: Training Plan
Task 10: Partnership
Task 12: Comprehensive Pilot Deployment (CPD) Plan
Task 11: Outreach Plan
WHAT IS REQUIRED FOR PERFORMANCE MEASUREMENT?

- Pilot Deployment ConOps (Task 2)
  - Identify performance measures and targets through stakeholder interaction

- Performance Measurement and Evaluation Support Plan (Task 5)
  - Identify procedures to estimate quantitative measures (to be built into pilot deployment system as core capability in Phase 2)
  - Identify and mitigate impacts of confounding factors that can potentially influence the outcome
  - Identify current case (“no Pilot Deployment”) and operational case (“with Pilot Deployment”) for benchmarking system performance
  - Identify, by data source, the data elements, frequency, precision, and nature of observed data to be collected
  - Describe plans to incorporate modeling and simulation to assist in key performance estimation
  - Describe protocols to record action logs by participants
  - Identify methods to identify/generate use cases that have the most impact
  - Describe support to evaluation effort
  - Describe process for sharing data
WHAT IS REQUIRED FOR PERFORMANCE MEASUREMENT? (CONT.)

- **Pilot Deployment SyRS (Task 6)**
  - Specify requirements corresponding to performance measurement-related needs in ConOps
  - Specify requirements corresponding to procedures for estimating measures

- **Training Plan (Task 9)**
  - Include guidance or training on how to record Participant Action Logs (consistent with the protocols developed in Task 5)
    - E.g.: type and frequency of information that needs to be recorded and the approach for recording

- **Partnership Coordination and Finalization (Task 10)**
  - Include status of partner consensus on measures and targets

- **Deployment Outreach Plan (Task 11)**
  - Participate in two USDOT-organized webinars per year and report performance in an easily-understandable and accessible format

- **Comprehensive Pilot Deployment (CPD) Plan (Task 12)**
  - Identify key measures of performance and methods for assessing impacts on a continuous basis
PERFORMANCE MEASUREMENT CHALLENGES AND POSSIBLE SOLUTIONS

- **Erroneous Data**
  - *Issue*: Performance measurement based on erroneous data can be misleading, and lead to lack of credibility and usefulness of estimated performance
  - *Possible Solution*: Calibrate equipment, establish data quality standards, and check for quality using a combination of automated and manual procedures

- **Data Gaps**
  - *Issue*: Depending on gap size, continuous performance monitoring can be interrupted significantly leading to failure in capture of inherent trends and patterns
  - *Possible Solution*: Apply data imputation technique that is chosen based on size of data gap relative to total dataset, underlying distribution of missing data variable (if known), and availability of statistical packages

- **Measurement Uncertainty due to Equipment**
  - *Issue*: Wear and tear and environmental conditions may impact performance of data collection equipment
  - *Possible Solution*: Calibrate data collection equipment regularly to ensure consistent performance

- **Confounding Factors**
  - *Issue*: Confounding factors are external factors which can distort the validity of experimental findings if not controlled for
  - *Possible Solution*: Use appropriate experimental designs or statistical techniques (e.g., counterfactual modeling, modeling and simulation, cluster analysis)
### Key References

- **Data Quality Checking (Task 5)**

- **Imputation Techniques for Data Gaps (Task 5)**

- **Performance Reporting (Task 11)**
TECHNICAL SUPPORT: PERFORMANCE MEASUREMENT

- Proposed opportunities for coordination on Performance Measurement

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<tr>
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<tr>
<td>Site-Specific Performance Measurement Key Concepts and Challenges Webinar (one for each Site conducted separately)</td>
<td>Award + 20 weeks</td>
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</tbody>
</table>

- Read the *Guidance Summary on Performance Measurement*
- Get help by contacting your federal site lead/site COR to reach the Performance Measurement Lead, Dr. John Halkias
- Go to CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots) for up to date information on the Pilots
CONNECTED VEHICLE PILOT Deployment Program

Evaluation Support

Walter During, FHWA, CV Pilots Evaluation Lead

ITS Joint Program Office
INDEPENDENT EVALUATION PURPOSE AND NEEDS

**Purpose**

- Inform prospective deployers of CV-enabled applications of likely safety, mobility, environmental, and public agency efficiency (SMEP) impacts; quantify costs; and identify practical institutional and financial models for long-term deployment
- Inform USDOT on effectiveness of the CV Pilots program in creating proven and transferable deployment concepts demonstrating measurable short-term SMEP impacts and longer-term transformational changes, overcoming deployment challenges, documenting lessons learned, and accelerating deployment of successful and sustainable CV applications

**Needs**

- **Site-Specific Evaluation:** Conduct cost-benefit analyses and assess user acceptance/satisfaction of pilot deployments; assess efficacy of deployed institutional and financial models; document lessons learned
- **National-Level Evaluation:** Conduct national-level evaluation of CV Pilots Deployments
- **Program Evaluation:** Assess whether performance-management focus of pilot deployments was beneficial; assess if the program achieved its vision cost-effectively
INDEPENDENT EVALUATION CONSTRAINTS

- **Multiple Players**
  - Essential to make roles well-defined and synergistic, and reduce overlap and redundancy in responsibilities to minimize wasted resources

- **Diverse Projects**
  - Multiple projects with diverse deployments, each with different objectives, performance targets, and impacts

- **Multiple Tiered Evaluations**
  - Evaluations need to be conducted both at site-level as well as national-level, and for examining both current as well as future impacts
  - Evaluation needs to encompass assessment of SMEP impacts, user satisfaction, return-on-investment, and institutional and financial models

- **Unbiased Evaluation Findings**
  - Evaluations can become biased due to an inability to isolate the impacts of the pilot deployments from those of exogenous factors (e.g., rising fuel prices, series of adverse weather events) or competing projects; requires rigorous evaluation design
PHASE 1 EVALUATION-RELATED ACTIVITIES

Phase 1

VOLPE

Survey Instrument Designer (SID)

VOLPE

Safety Evaluation Designer (SED)

COORDINATION

COORDINATION

COORDINATION

COORDINATION

TSSC

Mobility, Environmental, Public Agency Efficiency Evaluation Designer (MED)

EVAL. NEEDS

PII DATA (Planned)

EVAL. NEEDS

Non-PII DATA, PM (Planned)

Pilot Deployers

RDE
PHASES 2,3 EVALUATION-RELATED ACTIVITIES
RELEVANT DELIVERABLES

Task 5: Performance Measurement and Evaluation Support (Draft, Final, Webinar)
Identifies data flows provided to support the independent evaluation effort, including non-PII (Personally Identifiable Information) data through the Research Data Exchange and PII data directly to USDOT

Support to Independent Evaluation Effort. COR will provide broader evaluation-related capabilities required to support site-specific independent evaluation effort. The Performance Measurement Plan shall specifically identify data flows (including but not limited to field data, calculated performance measures, and action log entries) that will be provided to support the evaluation effort.

Development of the Evaluation Support section of the Plan is influenced by or influences other deliverables…

Task 2: ConOps
Task 3: Privacy Considerations
Task 4: SyRS
Task 5: Evaluation Support
Task 6: SyRS
Task 7: Training Plan
Task 8: Human Use Approval
Task 9: Training Plan
Task 10: Comprehensive Pilot Deployment (CPD) Plan
Task 11: Evaluation-related elements
Task 12: Comprehensive Pilot Deployment (CPD) Plan
Phase 1 - Months
0 3 6 9 12
Evaluation-related elements
U.S. Department of Transportation
WHAT IS REQUIRED TO SUPPORT THE INDEPENDENT EVALUATION EFFORT?

- **Pilot Deployment ConOps (Task 2)**
  - Identify evaluation-related needs and incorporate COR-identified needs for supporting an independent evaluation effort

- **Pilot Deployment SyRS (Task 6)**
  - Specify requirements corresponding to evaluation-related needs in ConOps

- **Performance Measurement and Evaluation Support Plan (Task 5)**
  - Identify data that will be provided to support independent evaluation effort:
    - raw and cleaned field data; performance measures; action log entries contemporaneous with collected field data

- **Training Plan (Task 9)**
  - Include provision for training independent evaluators, similar to other Site-recruited participants, if evaluators wish to become active participants as it will give them more insight into the deployment (i.e., if COR-identified need)

- **Human Use Approval (Task 8)**
  - Sites’ IRB may need to consider that participants in evaluation-related activities may also be deployment participants (i.e., if COR-identified need)
WHAT IS REQUIRED TO SUPPORT THE INDEPENDENT EVALUATION EFFORT? (CONT.)

- Comprehensive Pilot Deployment (CPD) Plan (Task 12)
  - *Data* - Identify data to be generated by the system and shared with USDOT, including but not limited to their nature, frequency, and attendant meta-data:
    - Nature of data (e.g., raw or cleaned; disaggregate or aggregate; performance measure, action logs)
    - Type of data (e.g., transit schedule delays; dray orders; trip times; number of curve speed warning messages; SPaT data)
    - Sources (e.g., vehicle onboard unit; action logs)
    - Frequency of updates (e.g., daily, hourly, weekly)
    - Corresponding meta-data
  - *Phase 2 and Phase 3 Pilot Site Schedule and Cost Estimate* - Incorporate time and cost needed for:
    - Coordinating with evaluators
    - Responding to surveys administered by evaluators
    - Making Site available for additional tests to be conducted by evaluators (i.e., if COR-identified need)
EVALUATION SUPPORT CHALLENGES AND POSSIBLE SOLUTIONS

- **Retention of Knowledge**
  - **Issue**: Possible staff turnover due to long duration of pilot; can lead to wasted resources and falling behind schedule
  - **Possible Solution**: Document procedures, processes, challenges, and resolutions frequently and share with evaluators; share public information with other sites through a CV Pilots discussion forum or a Site-Specific discussion forum

- **Multiple Coordination Events with Multiple Entities**
  - **Issue**: Multiple coordination activities and support with multiple entities can be a drain on resources if not carefully planned
  - **Possible Solution**: Assign dedicated staff knowledgeable in various aspects of deployment; allocate resources and time for coordination and support in CPD plan

- **CV Pilot Deployment Participation by Evaluators**
  - **Issue**: Operations can be disrupted if evaluators want to be active participants (but likely beneficial to Sites as findings will be more plausible)
  - **Possible Solution**: Accommodate evaluators and train them

- **Scoping Support to Additional Field Tests by Evaluators**
  - **Issue**: Operations can be disrupted if other entities conduct tests and roles and responsibilities are not clearly defined upfront
  - **Possible Solution**: Clearly identify in CPD plan the scope of support provided to evaluators, liability issues, cost, and schedule
**TECHNICAL SUPPORT: EVALUATION SUPPORT**

- Proposed opportunities for coordination on Support to Evaluation Effort

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site-Specific Evaluation Needs Webinar (one for each Site conducted separately)</td>
<td>Award + 8 weeks</td>
</tr>
<tr>
<td>Site-Specific Evaluation Design Webinar (one for each Site conducted separately)</td>
<td>Award + 20 weeks</td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on Evaluation Support*
- Go to CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots) for up to date information on the Pilots
- Get help by contacting your federal site lead/site COR to reach the Evaluation Support Lead, Walter During
Performance and Measurement Data from CV Pilot deployments will be shared:

- With performance evaluators

The Performance Measurement Plan shall include a Data Sharing Framework, a description of performance measurement data to be generated and transmitted to COR, including the frequency of these updates...

- With the CV community

Data sharing. Connected vehicle, mobile device, and infrastructure sensor data captured during the operational phase of the effort is expected to be broadly shared with the community to inform other deployers and prospective deployers of connected vehicle applications.

The Data Sharing Framework is required in Task 5: Performance Measurement. Data-sharing requirements shall also be included in the System Requirements Specification (SyRS), defined in Task 6.
DATA SHARING AND RELEVANT DELIVERABLES

Task 2: ConOps

Task 3: Privacy Considerations

Task 4: Evaluation Support

Task 6: SyRS

Task 9: Training Plan

Task 12: Comprehensive Pilot Deployment (CPD) Plan

COR-identified evaluation needs

Data-sharing-related elements

Phase 1 - Months

0 3 6 9 12
The RDE is a Web-based resource that collects, manages, and provides access to multi-source and multi-modal transportation data.

- Quality-checked, well-documented, and freely available to the public.
- Currently has ITS and connected vehicle data from 13 locations.
- More data environments will be added, including data from Dynamic Mobility Application (DMA) prototypes.
- The Saxton Traffic Operations Laboratory may hold data that cannot be released to the public.

Appropriately prepared system control, performance and evaluation data are expected to be shared with the USDOT and posted in timely fashion on resources such as the Research Data Exchange.
SOUTHEAST MICHIGAN TEST BED IS AN EXAMPLE

- The USDOT ITS JPO Connected Vehicle (CV) Test Bed in Oakland County, Michigan (known as the Southeast Michigan Test Bed) is designed to support the connected vehicle industry’s evolving needs for a test and development environment.

- The Test Bed is a working example of data generation, transmission, and storage following ITS standards.

- CV Pilot deployers are invited to follow the example of the Test Bed in designing messages, transmission capabilities, and data storage facilities.
**Desirable Data Properties**

- Standard non-proprietary format (e.g. text or common database format)
- Compliant with ITS standards
- Structured in files of manageable size
- Contains timestamps enabling correlation of data from different sources
- Collected from multiple source and multiple modes
- As disaggregated as possible
- Well-documented (the RDE provides guidelines for meta data document)
DATA SHARING CHALLENGES

- **Ease of Use for the Data**
  - Structure the data files for easy use – no mammoth files
  - Comprehensive documentation

- **Data Delivery Method**
  - Determine most useful method of providing data for evaluation and research

- **Data Quality**
  - Check data quality before, during, and after data collection.
  - Verify quality before transmitting for evaluation and sharing to the public

- **Personally Identifiable Information (PII) (See Task 3)**
  - Data shared with the public must not contain PII or intellectual property or proprietary information
  - Design CV pilot deployment to collect as little PII as necessary
    - If PII is necessary, delete it as soon as possible or arrange for data to go to the Saxton Lab
    - Review data to ensure no intellectual property or proprietary information included

- **Timeliness**
  - Get data quality checked and documented soon while expertise is available
**KEY REFERENCES**

- Data Transfer Guidance for Dynamic Mobility Applications Bundle Teams *
- Adding Data to the Research Data Exchange and Saxton Transportation Operations Laboratory: Process and Issues to Consider *
- Research Data Exchange
  - [https://www.its-rde.net/](https://www.its-rde.net/)
- Metadata Guidelines for the Research Data Exchange
  - [https://www.its-rde.net/rdeabout/faq](https://www.its-rde.net/rdeabout/faq)
- Concept of Operations for the Southeast Michigan Test Bed
- Connected Vehicle Reference Implementation Architecture (CVRIA)

* Available from the COR*
TECHNICAL SUPPORT SUMMARY: DATA SHARING

- Proposed CV Pilots Data Sharing Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Webinar for Data Sharing (30 min)</strong></td>
<td>Award + 12 Weeks</td>
</tr>
<tr>
<td>- Detailed walkthrough of the Data Sharing Guidance</td>
<td></td>
</tr>
<tr>
<td>- Q&amp;A</td>
<td></td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on Data Provision from CV Pilots*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Southeast Michigan Test Bed
- Get help by contacting your federal site lead/site COR to reach the data sharing lead
CONNECTED VEHICLE PILOT
Deployment Program

System Requirements

Walt Fehr, Transportation Technologies Specialist

ITS Joint Program Office
RELEVANT DELIVERABLES

Task 6: System Requirements
Each performance measure and target identified in the ConOps in Task 2 should have a corresponding performance requirement. The SyRS must be consistent with and support all essential elements of the Performance Measurement Plan (Task 5).

The System Requirements shall identify what the Pilot Deployment must accomplish; identify the subsystems; and define the functional and interface requirements among the subsystems.

The influence of the System Requirements should be reflected in other deliverables...

Task 2: Pilot Deployment Concept of Operations
Task 5: Performance Measurement
Task 11: Outreach Plan
Task 12 Comprehensive Deployment Plan
Task 6: System Requirements

Phase 1 - Months

0 3 6 9 12

- Concept of Operations elements
The Contractor shall develop a System Requirements Specification (SyRS) Document based on the COR-approved ConOps, following the guidance in IEEE Standard 1233-1998. At a minimum, the following requirements shall be included:

- **Functional requirements**
  - Including communications, security, and safety requirements

- **Interface requirements**
  - including identification of relevant standards (where appropriate)

- **Performance requirements**
  - including system performance targets and performance requirements

- **Data requirements**
  - including data-sharing requirements
CVRIA AND SET-IT

- Connected Vehicle Reference Implementation Architecture (CVRIA) is a graphical language for describing ITS systems and applications. It defines multiple viewpoints, each of which captures a particular perspective which helps to define the system as a whole.

- The System Engineering Tool for Intelligent Transportation (SET-IT) is a software tool for authoring system definitions. It provides a graphical interface and access to a library of pre-defined applications. SET-IT simplifies the task of preparing standard documents, and promotes reuse of application definitions with its library.
SYSTEM REQUIREMENTS CHALLENGES

- **Measurement**
  - Issue: Difficult to measure system requirements
  - Possible Strategy: Reference Performance Measures. Tie data collection requirements into System Requirements.

- **Stakeholder Input**
  - Issue: Input from stakeholders may not cover all issues to solve
  - Possible Strategy: Be sure to get a representative sample from multiple organizations and different public private sector spheres.

- **Data Requirements**
  - Issue: Unclear what requirements to put into system
  - Possible Strategy: Derive requirements directly from stakeholder needs. Make sure they match up and are not being derived from other means.

- **Testing**
  - Issue: How will the requirements be tested later on in the project?
  - Possible Strategy: Take into account system testing early in the system requirements process.
KEY REFERENCES

TECHNICAL SUPPORT SUMMARY: SYSTEM REQUIREMENTS

- Proposed CV Pilots System Requirements Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Architecture Boot camp</td>
<td>3 Weeks after Kickoff</td>
</tr>
<tr>
<td>Bi-Weekly Systems Engineering round-tables</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Read the Guidance Summary on System Requirements
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the system requirements lead Walt Fehr
CONNECTED VEHICLE PILOT Deployment Program

Application Deployment Plan and Open Source

Gene McHale, Team Leader

ITS Joint Program Office
Task 7: Application Deployment Plan (Draft and Final)

Systematically assess the requirements to incorporate into the selected applications as a part of the deployment concept. These application deployment requirements shall be incorporated into the System Requirements Specification (SyRS) document (Task 6).

This plan describes the additional functionality and/or performance elements required to further develop, tailor, and integrate applications for use within the Pilot Deployment. Each identified application modification shall be accompanied by an assessment of the amount of development work required in Phase 2 (both schedule and cost).

The influence of the Application Deployment Plan should be reflected in other deliverables…
WHAT IS REQUIRED OF A CV APPLICATION

- New Code Development Under CV Pilot must
  - Be made available through the OSADP
  - Be licensed under an Open Source License (Apache 2.0 preferred)
- Existing applications brought to the pilot deployment need not be made open source
  - However, code related to new interfaces or enhancements added with Pilots funding are expected to be made open source

- At least one application needs to use Connected Vehicle Security Credential Management System (SCMS)

- Requirements must be derived from the System Requirements Specification (SyRS) document (Task 6)

- Follow software development best practices (traceability, coding standards, unit testing, regression testing, user acceptance, etc.). Note: development processes are left to the discretion of the individual Pilots
APPLICATION CHALLENGES

- **Archiving CV Pilot Code**
  - Issue: Not knowing what to archive
  - Possible Strategy: Review OSADP requirements and work with USDOT client for suggestions

- **Supporting Integration and Future Use**
  - Issue: Making sure the application is useful and relevant beyond the Pilot
  - Possible Strategy: Develop code with reusability in mind from the start to encourage future use

- **Utilizing the Security Credential Management System (SCMS)**
  - Issue: Unsure of how to implement the SCMS
  - Possible Strategy: Review SCMS site and meet with USDOT security team

- **Cost and Schedule**
  - Issue: Tight schedule and limited funds for development
  - Possible Strategy: Maintain strong control and monitoring of cost and schedule of the development
**KEY REFERENCES**

- Open Source Application Development Portal (OSADP) Release Process  
  [http://itsforge.net/applications/release-process](http://itsforge.net/applications/release-process)

- Research Data Exchange (RDE)  [https://www.its-rde.net](https://www.its-rde.net)

- *Connected Vehicle Data Capture and Management (DCM) and Dynamic Mobility Applications (DMA) Assessment of Relevant Standards and Gaps for Candidate Applications*, FHWA-JPO-13-019, October 2012,  

- Connected Vehicle Security and Credentials Management  

- Apache 2.0 License  [http://www.apache.org/licenses/LICENSE-2.0](http://www.apache.org/licenses/LICENSE-2.0)
## Technical Support Summary: Application Deployment Plan

- Proposed CV Application Deployment Plan Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>OSADP Submission Requirements Webinar</td>
<td>TBD</td>
</tr>
<tr>
<td>General Application Round-tables</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on the Application Development Plan*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the Application Deployment Plan lead Gene McHale
CONNECTED VEHICLE PILOT
Deployment Program

Human Use Approval

Govind Vadakpat, Research Transportation Specialist, FHWA

ITS Joint Program Office
RELEVANT DELIVERABLES

Task 8: Human Use Approval Summary (Draft and Final)

Describes the research project involving human subjects (i.e., a summary of your Institutional Review Board (IRB) application) and identifies the accredited IRB that granted approval for the research.

_The Contractor shall obtain Human Use Approval from an accredited Institutional Review Board (IRB). Note that the COR will not act as an IRB for the purposes of the Pilot Deployment_. The Contractor is responsible for granting IRB approval for human participation within the Pilot Deployment.

_The influence of the Human Use Approval Summary should be reflected in other deliverables_...

Task 2: ConOps

Task 3: Privacy and Security Operating Concept

Task 4: Safety Plan

Task 5: Performance Measurement

Task 8: Human Use Approval Summary

Task 9: Training

Task 12 Deployment Plan

- IRB elements

Phase 1 - Months
SCOPE OF HUMAN USE APPROVAL

- Gain understanding of IRB requirements, process, and timing
- Identify IRB affiliated with team member, or search for third-party IRB
- Collect information about your IRB’s approval process
  - Review application and requirement for additional documentation required by the IRB as part of the approval process and post-approval (e.g., informed consent form)
  - Determine if training is required before submitting application
  - Determine timeframe for IRB approval, factor in time for review and comment period
- Complete application for IRB approval
- Actively monitor approval process
- Develop Human Use Approval Summary
- Update IRB application/amendments, as required/dictated by project updates
- Coordinate Human Use Approval with other entities as required, and the CV Pilot Independent Evaluator (IE)
HUMAN USE APPROVAL CHALLENGES

- No available “internal” IRB
  - Issue: No members of the project team have an “internal” IRB
  - Possible Strategies: Search for similar institutions/organizations that have an IRB willing to approve your research project (“external” IRB)

- IRB Process Affects Schedule
  - Issue: IRB continues to request additional information, or requires additional time
  - Possible Strategies: Initiate effort early in Phase I, seek additional information about the approval process, take on-line training, and request in-person meeting to obtain assistance with approval. Identify team member responsible for periodic check in with IRB

- Conflicts with Other Tasks
  - Issue: Activities in other tasks are in conflict with description provided in IRB application
  - Possible Strategy: Determine potential conflicts and interdependencies across tasks at early stage and plan coordination meetings with relevant personnel to ensure consistency.
KEY REFERENCES

TECHNICAL SUPPORT SUMMARY: HUMAN USE APPROVAL

- Proposed CV Pilots Human Use Approval Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>Human Use Approval Webinar</td>
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</tr>
<tr>
<td>Human Use Approval Round-tables</td>
<td>TBD</td>
</tr>
<tr>
<td>Human Use Approval Q&amp;A Webinar II</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Read the *Guidance Summary on Human Use Approval*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the human use approval lead, Govind Vadakpat
RELEVANT DELIVERABLES

Task 9: Participant Training and Stakeholder Education Plan (Draft and Final)

Describes the underlying needs of the Pilot Deployment to prepare a plan for the recruitment and training of all participating drivers and personnel to permit satisfactory use and servicing of the equipment.

The Participant Training Plan shall identify the roles that participants will take during the pilot deployment, including a rough description of their activities and responsibilities, and likely training requirements needed to ensure as-planned execution of the pilot deployment in the operational phase.

The Participant Training and Stakeholder Education Plan will consider components from several other deliverables....
TRAINING SCOPE

- Identify stakeholder and participant groups for the operational phase
  - Partition Stakeholder Registry into groups that require training (Task 9) vs. groups that can be informed through more general outreach (Task 11).

- Educate stakeholders and set the stage for post-pilot period operations
  - Inform stakeholders upfront about the scope and goals of the pilot; garner their interest in involvement, ensure that technologies deployed can be maintained post-deployment.

- Recruit Participants
  - Attract target participants through appropriate media (contingent on IRB-approval).

- Train participants on their roles and expectations for the pilot
  - Outline training approach and materials (formal vs. informal instruction, use of mock-ups, models, manuals, diagrams, parts catalogs, etc.)

- Evaluate training
  - Participants should exhibit knowledge gained from training through assessments.
TRAINING KEY CHALLENGES

- **Coordination of IRB process and recruiting participants**
  - **Issue**: Participant candidates cannot be approached unless IRB-cleared.
  - **Possible Solution**: Start the IRB certification process as soon as possible.

- **Recruiting particular participant groups**
  - **Issue**: Participants with certain characteristics will be needed (e.g. possession of specific types of licenses, visually impaired in the case of PED-SIG, etc.)
  - **Possible Solution**: Recruit directly through specific media (e.g. commercial agencies)

- **Planning and coordination of diverse training requirements**
  - **Issue**: Difficult to offer training sessions that accommodate all targeted stakeholder groups
  - **Possible Solution**: Survey training groups to figure out their availability; offer multiple sessions.

- **Retaining participants**
  - **Issue**: Participant turnover requires additional training.
  - **Possible Solution**: Provide incentives; touch-base with participants every so often.
KEY REFERENCES

- Professional Capacity Building Program website
  - www.pcb.its.dot.gov/

- Talking Transportation Technology (T3) Webinars
  Connected Vehicle Basics (April 24, 2014)
  National Connected Vehicle Field Infrastructure Footprint Analysis (May 22, 2014)
  Connected Vehicle Workforce (September 10, 2015)
  - https://www.pcb.its.dot.gov/t3_archives.aspx

- Safety Pilot Model Deployment Test Conductor Team Report, DOT HS 812 171, June 2015


KEY REFERENCES (CONTINUED)

- System Requirements (Task 6) Training
  
  CVRIA Training

  SET-IT Tool Training
TECHNICAL SUPPORT SUMMARY: TRAINING

- Proposed CV Pilots Training Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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</thead>
<tbody>
<tr>
<td>USDOT Training Webinar</td>
<td>Kickoff + 20 weeks</td>
</tr>
<tr>
<td>Bi-weekly Training Round-tables (for all sites)</td>
<td>TBD</td>
</tr>
</tbody>
</table>

- Read the guidance summary on *Participant Training and Stakeholder Education*
- Go to CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots) for up to date information on the Pilots
- Get help by contacting your federal site lead/site COR to reach the training lead Mac Lister
CONNECTED VEHICLE PILOT Deployment Program

Institutional, Business and Financial Issues

Carl Andersen, FHWA, Connected Vehicle Program Manager

ITS Joint Program Office
INSTITUTIONAL, BUSINESS, AND FINANCIAL ISSUES

It is often said that CV deployment is technically feasible but the real challenges are institutional…

It is essential to address the key institutional and related institutional business, and financial issues. Some important ones are:

- National interoperability
- Security and credentials
- Maintenance and operation of equipment
- A framework that supports safe interactions between different road users (regular and priority vehicles, pedestrians, bicyclists)
- Revenue to sustain CV applications
- Other (MOUs, legal, regulatory, Institutional Review Board)
**RELEVANT DELIVERABLES**

**Task 10:** To ensure the partnership coordination and finalization occurs properly, the existing, desired and implemented institutional framework and business approaches need to be addressed along with the technical tasks, the performance evaluation, and ways to achieve financial sustainability.

*Document …agreement on the main elements of the ConOps, performance measures and targets, operational changes…, governance framework and processes, and financial agreements, and a vision of how these arrangements…in the post deployment period …transition to permanent operational practice.*

*Institutional and business models plus financial sustainability in other deliverables…*
BACKGROUND ON INSTITUTIONAL/BUSINESS MODELS

AASHTO Footprint Analysis – largely incremental deployment (DOT-centric); possibly some Public-Private Partnerships (PPPs) and creative business models and financing

Should address existing (As Is), desired (To Be), and Implemented cases

1. Application level business process maps (microscopic)
   - People-oriented use cases (technology secondary)
   - Shows main steps where benefits of CV accrue and are produced
   - Direct or implied linkage to performance

2. High level (macroscopic) – oriented toward people and organizations
   - Capability Maturity Model
   - Business models that cover CV deployment lifecycle

Financial sustainability – most likely traditional revenue sources but possibly PPPs and more creative business models

1. Formal commitments needed among funding organizations
2. Business plan, including financial statements, may be desirable
Institutional, Business and Financial Challenges

- Identifying size of risks associated with institutional issues
  - Issue: Large uncertain costs and schedule delays can arise due to institutional issues
  - Possible Strategy: Set out mitigation actions in Risk Management Plan

- Adopting user rather than technology orientation
  - Issue: Technical feasibility is clear; institutional issues are more challenging
  - Possible strategy: Integrate institutional, business/financial considerations in Phase I

- Achieving financial sustainability
  - Issue: Resolve the extent that deployment will be incremental and rely on government funding or use less traditional approaches to continue CV
  - Possible Strategy: Allocate some role for PPPs, leveraged assets (data, ROW), creative financing, and/or new viable businesses involving cooperation of pilot sites.

- Evaluating institutional and business models
  - Issue: How to see through complexity and assess financial feasibility of each approach
  - Possible Strategy: Use business planning in measured and agile manner.
KEY REFERENCES

- J. Wright (AASHTO) et. al., National Connected Vehicle Field Infrastructure Analysis, 2014

- AASHTO National Connected Vehicle Field Infrastructure Footprint Analysis (Webinar)


- Overcoming Barriers to ITS, Lessons from Other Technologies, Final Report, 1996,

- Michael Rappa, Business Models on the Web, Managing the Digital Enterprise
  http://digitalenterprise.org/models/models.html

The summary guidance document concerning institutional, business, and financial sustainability offers additional useful references.
Proposed Events

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institutional/Business Models, Financial Sustainability, Webinar I</td>
<td>TBD</td>
</tr>
<tr>
<td>Round-tables on Institutional and Business Models</td>
<td>TBD</td>
</tr>
<tr>
<td>Institutional/Business Models, Financial Sustainability, Webinar II</td>
<td>TBD</td>
</tr>
</tbody>
</table>

Read the *Guidance Summary on Institutional and Business Models and Financial Sustainability*

CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)

Get help by contacting your federal site lead/site COR to reach the institutional/business/financial lead Brian Cronin
Connected Vehicle Pilot Deployment Program

Deployment Outreach Plan

Mike Pina, Program Manager, ITS JPO Communications

ITS Joint Program Office
RELEVANT DELIVERABLES

- **Public Webinars:** The Contractor shall deliver the following three public webinars for interested internal and external stakeholders **during Phase 1**
  - *ConOps Webinar* – A one-hour webinar that describes the approved deployment concept.
  - *Performance Measurement Webinar* – A one-hour webinar that describes the approved performance measurement plan.
  - *Deployment Plan Webinar* – A one-hour webinar that describes comprehensive deployment concept.

  The Contractor shall coordinate with COR in scheduling, promoting, and delivering this webinar. COR staff will monitor the webinar and track comments and questions off-line using a chat box or similar function. At the end of the webinar, the Contractor staff shall be asked to verbally respond to these off-line comments. The COR will record the webinar, and post all briefing materials, questions and answers on the COR CV Pilots website.

- **Webinar Timeline**
  - Task 2: ConOps
  - Task 5: Performance Measurement
  - Task 12: Deployment Plan

  - Public Webinars
RELEVANT DELIVERABLES

Task 11: Deployment Outreach Plan (Draft and Final)

Prepares a high-level plan for the management of Outreach activities in the Deployment Phases (Phase 2 and Phase 3), consistent with the Comprehensive Pilot Deployment Plan (Task 12). This plan covers both outreach activities and the accommodation of requests for site visits by media, researchers, and others.

The Outreach Plan shall include regular coordination with USDOT communications staff, to facilitate the branding, re-use and redistribution of materials developed by USDOT and the Contractor.

The influence of the Outreach Plan should be reflected in other deliverables…
REQUIREMENTS OF THE OUTREACH PLAN

- Outreach Plan shall articulate proposed:
  - Media strategy for both local and national press
  - Media coordination with the USDOT
  - Web/social media presence
  - Local outreach
  - Crisis Communications Plan

- Outreach Plan should include a PR/Marketing plan describing the site end-to-end professional development and delivery of the materials listed in the BAA
  - e.g., News articles, press releases, brochures, fact sheets, etc.

- Anticipated minimal levels of Outreach are listed in the BAA
  - e.g., 2 local press conferences/year, participation in 2 public meetings/year, etc.

- Personnel for Phase 2 and Phase 3
  - A Site Outreach Lead – responsible for coordinating outreach requests
  - A Site Outreach Spokesperson – speaking for the Pilot Deployment
OUTREACH CHALLENGES

- **Target Audience**
  - Issue: Sending the right message to the right group
  - Possible Strategy: A comprehensive outreach plan identifying target groups and messages to be sent

- **Coordination/Consistency**
  - Issue: Coordinating with USDOT/local agencies/media/training to send consistent messages
  - Possible Strategy: Dedicated Site Outreach Lead meets monthly with USDOT (by phone) and coordinating with the training task lead

- **Sensitive Policy Issues**
  - Issue: Media raises questions related to security, privacy, spectrum etc.
  - Possible Strategy: Send all policy related media inquiries through the federal site lead/site COR/outreach lead to get approval from USDOT PA
KEY REFERENCES

- Connected Vehicle Fact Sheets
  http://www.its.dot.gov/its_program/its_factsheets.htm

- Connected Vehicle Basics Microsite
  http://www.its.dot.gov/cv_basics/index.htm

- USDOT, Public Involvement Techniques for Transportation Decision-making

- USDOT, ITS JPO Publication Guidelines/508 Compliance
  http://www.its.dot.gov/pubsguidance.htm

- ITS JPO downloadable images
### Technical Support Summary: Outreach

- **Proposed CV Pilots Phase 1 Webinar Support**

<table>
<thead>
<tr>
<th>Schedule Item</th>
<th>Date</th>
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<tbody>
<tr>
<td>ConOps Webinar Coordination Call (30-60 min)</td>
<td>2-3 weeks before the webinar</td>
</tr>
<tr>
<td>PM Webinar Coordination Call (30-60 min)</td>
<td>2-3 weeks before the webinar</td>
</tr>
<tr>
<td>Deployment Webinar Coordination Call (30-60 min)</td>
<td>2-3 weeks before the webinar</td>
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</table>

- **Proposed CV Pilots Deployment Outreach Plan Support**

<table>
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<tr>
<th>Schedule Item</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Webinar for Outreach Plan Task (30 min)</td>
<td>Award + 28 Weeks</td>
</tr>
<tr>
<td>- Detailed walkthrough of the Outreach Guidance</td>
<td></td>
</tr>
<tr>
<td>- Q&amp;A</td>
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</tr>
</tbody>
</table>

- Read the *Guidance Summary on Outreach*
- CV Pilots Program Website: [http://www.its.dot.gov/pilots](http://www.its.dot.gov/pilots)
- Get help by contacting your federal site lead/site COR to reach the outreach lead Mike Pina
CONNECTED VEHICLE PILOT Deployment Program

Comprehensive Pilot Deployment Plan and Deployment Readiness

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**RELEVANT DELIVERABLES**

**Task 12: Comprehensive Pilot Deployment (CPD) Plan (Draft, Final, Public Webinar)**
Pulls together work conducted in all the tasks to make a clear story for the deployment in the CPD plan, and shares that plan with the general public through a webinar

*Drawing on all materials prepared in Tasks 2-11, this plan shall summarize the overarching pilot deployment concept and expected outcomes.*

**Task 13: Deployment Readiness (Draft, Final, Briefing to COR)**
Assesses the readiness of the Task 12 materials to form the core of the Phase 2 Cooperative Agreement in a summary document and briefing primarily to the COR and USDOT and FHWA Contracts

*The Contractor shall prepare a Deployment Readiness Summary, addressing the ... key elements of the Pilot Deployment required to initiate the Design/Build/Test Phase of the effort*
Development of the CPD Plan and Deployment Readiness are *influenced by* deliverables from all other tasks…
WHAT IS REQUIRED FOR CPD PLAN AND DEPLOYMENT READINESS?

CPD Plan
- Summarizes the overarching pilot deployment plan combining elements from all tasks, including:
  - Summary of objectives
  - Geographic scope
  - Applications
  - Number vehicles, mobile devices, participants, and infrastructure
  - Performance measures and methods to continuously monitor them
  - Steps to ensure system security and participant safety and privacy
  - Data to be generated by system and corresponding meta-data
  - List of open source software available from system
  - Schedule and cost

Deployment Readiness
- Makes the case to the COR that the Contractor has satisfied all elements required for a pilot deployment and is ready to respond to an agreement that funds the design, build, test, and operation of the proposed pilot deployment
CPD PLAN CHALLENGES AND POSSIBLE SOLUTIONS

- **Infeasible Schedule Assessment**
  - **Issues**: Need for proposed hardware equipment to follow regulations, get approval from state or local governing authority, and comply with NEPA and NHPA; human use approvals; and dependency on external suppliers can lead to schedule slips
  - **Possible Solution**: Identify schedule in agreements with suppliers and partners; include provision in Phase 2 and Phase 3 for schedule risk identification and mitigation strategy; work with COR as soon as a potential schedule slip is identified

- **Unrealistic Cost Assessment**
  - **Issue**: Multiple coordination activities and ad hoc support to independent evaluation effort can lead to disruption of operations and wasted resources if not carefully planned
  - **Possible Solution**: Clearly identify in CPD plan the number and type of coordination events, scope of support provided to evaluators, liability issues, roles and responsibilities of partners and evaluators

- **Stakeholder Disinterest**
  - **Issue**: Inability to convey or engage the broader community in the proposed pilot deployment concept leading to disinterest in the concept and the connected vehicles program
  - **Possible Solution**: Publicize webinar to local as well as broader set of stakeholders; develop webinar materials that are easily-understandable and accessible to broader community, not engaged in connected vehicles; highlight key elements of plan
DEPLOYMENT READINESS CHALLENGES AND POSSIBLE SOLUTIONS

- Changes from Initial Proposed Approach
  - **Issue:** In developing the ConOps and further products & deliverables, the scale or scope of the originally proposed CV Pilot approach has to be changed, resulting in changes to proposed staffing, schedule, or costs for design, build, test, and operation under Phases 2 & 3.
  - **Possible Solution:** Fully describe any changes from the original proposed estimated scope, team/staff, schedule, or costs for Phases 2 & 3. Identify any risks & their possible mitigation associated with significant changes to aid USDOT in its assessment of the Pilot’s readiness to enter into deployment.
TECHNICAL SUPPORT: CPD PLAN AND DEPLOYMENT READINESS

- Get help by contacting your federal site lead/site COR
- Go to CV Pilots Program Website: http://www.its.dot.gov/pilots for up to date information on the Pilots