Connected Vehicle Pooled Fund Study

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The Pooled Fund Study (PFS) is a partnership of transportation agencies who have established a program to facilitate the development and evaluation of Connected Vehicle applications.

The program will prepare state and local transportation agencies for the deployment of Connected Vehicle technologies.

The program will result in the following outcomes:

- Development and demonstration of connected technology, algorithms, tools and applications
- Preparation for field deployments
- Development and deployment documentation
- Lessons learned and identification of challenges from field deployments
Current PFS Membership

Core/Voting Members
- VDOT is lead agency with administrative support from UVA
- Fifteen Core Members: Virginia, California, Florida, Michigan, Minnesota, New Jersey, New York, Ohio, Pennsylvania, Texas, Utah, Washington, Wisconsin, Maricopa County and FHWA

Associate Members
- Palm Beach Co, FL; Oakland Co, MI; MTC (Bay Area), San Diego’s Regional Planning Agency, Los Angeles County Metropolitan Transportation Authority (Metro), Transport Canada, Arizona DOT, Rijkswaterstaat and North Texas Toll Authority

Liaisons
- NCHRP/SHRP 2; AASHTO (strategic and deployment plans)
The PFS was initiated as a phased program:

- **Phase I** - Research to educate to connected vehicle technologies
- **Phase II** - Develop and field testing connected vehicle applications
- **Phase III** – Continue develop and field testing connected vehicle applications
- **Dynamic Mobility Application** – Develop and field test a Multi-modal Intelligent Traffic Signal System (USDOT Partially Funded)

<table>
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<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Dynamic Mobility Application</th>
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<td><strong>Research to</strong></td>
<td><strong>Develop and field testing</strong></td>
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<td><strong>educate</strong></td>
<td><strong>connected vehicle technologies</strong></td>
<td><strong>connected vehicle applications</strong></td>
<td><strong>a Multi-modal Intelligent</strong></td>
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<td><strong>Traffic Signal System</strong></td>
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<td>(USDOT Partially Funded)</td>
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**Timeline:**
- July 2009
- July 2012
- July 2015
- Aug 2017
PFS Phase I Program
July 2009 – August 2012

• **Connected Vehicle Traffic Signal Control Algorithm** – Developed and evaluated a new traffic signal control algorithm using connected vehicle data

• **Pavement Maintenance Support Algorithm** – Determined the benefits of using CV probe data to develop IRI estimates and detect and map potholes

• **Evaluation of Signal Phase and Timing Data** – Developed CONOPS and benefits assessment for use cases of SPaT data

• **Connected Vehicle Certification Program** – Educated PFS members on potential issues related to a future connected vehicle certification program

• **Aftermarket On-Board Equipment** – Identified requirements for a Multi-Communications enabled OBE and provided recommendations for rapid introduction of equipment
• Traffic Management Centers in a Connected Vehicle Environment – Investigated how the Connected Vehicle environment will change the TMC of the future, both technically and the role of TMC operators/managers (Complete)

• 5.9GHz DSRC Vehicle Based Road and Weather Condition Application (Phase I) – Develop a 5.9GHz DSRC application that is used on fleet vehicles for road and weather condition data (Completed Phase I, moved to test in Phase II)

• Surveying/Mapping for CV Applications
  Analyze and document the surveying and mapping requirements for expected connected vehicle applications and determine best practices (Complete)
Objective: Develop and test a system that integrates connected vehicle information and devices into a more effective and safer traffic signal control system for multiple modes of travelers

Funded in part by USDOT to support its Dynamic Mobility Application Program

Phase I – Develop the CONOPS, systems requirements and system design (Complete)

Phase II – Demonstrate and field test the system in two locations
- Maricopa County, Arizona
- El Camino Real, California

Status
- CONOPS – complete
- Application development – complete
- Infrastructure deployment – complete
- Final documentation – complete
PFS Phase III Program
December 2015 - August 2017

• **Basic Infrastructure Message Development and Standards Support for Connected Vehicles Applications**
  - To be awarded in July/August
  - **Project objectives:**
    - To develop a Basic Infrastructure Message (BIM); and
    - To establish a means to collaborate with the relevant standards development organizations

• **5.9 GHz Dedicated Short Range Communication Vehicle Based Road and Weather Condition Application, Phase 2**
  - Awarded to Synesis Partners
  - **Project objectives:**
    - Building on work performed in Phase 1, to deploy a DSRC based Road Weather application in New York and Michigan
    - To evaluate and interface with existing back office systems, including
      - New York’s INFORM
      - Michigan’s DUAP
      - FHWA Weather Data Environment (WxDE)
Future Projects/Direction

Working with FHWA to develop the following projects:

- **Multi-Modal Intelligent Transportation System Phase III**
  - Gap analysis of what additional work needs to be completed to prepare MMITSS for large-scale deployment
  - Enhancement of existing application to state of deployment-ready software, documentation, etc.

- **Multi-Modal Intelligent Traffic Operations System**
  - Build on the foundation of MMITSS and other CV prototype applications to develop a Concept of Operations for a CV application(s) that integrates freeway and arterial operations to better manage the flow of traffic across the entire system

Additional focus:

- Coordination with Auto manufacturers
- Involvement with standards development
- Continue to develop and demonstrate CV technology and applications
<table>
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<tr>
<th>FY 2016</th>
<th>FY 2017</th>
<th>FY 2018</th>
<th>FY 2019</th>
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<td><strong>MMITSS Phase II</strong></td>
<td><strong>Surveying/Mapping</strong></td>
<td><strong>Vehicle Based Road Weather Application</strong></td>
<td><strong>Basic Infrastructure Message/Standards Support</strong></td>
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<td><strong>MMITOS Concept Development</strong></td>
<td><strong>Potential Field Deployment</strong></td>
<td><strong>Potential Design/Field Demonstration Test</strong></td>
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**Decision Gates:**
- In Progress
- Follow-On Cooperative Agreement

**Statuses:**
- Completed
- Underway
- In Development
Benefits Realized through PFS

Benefits

• Identify issues that require further research or development
• Readily available CONOPs and deployment documentation
• Deployment lessons learned and deployment guidance from other states
• Member peer exchanges
• Site visit to member deployments during face-to-face meetings
• Provide input to standards organizations for improvements or identify missing standards
• Shape a national interoperable system
• Identify potential challenges for CV deployments
  • Roadside Equipment is still maturing
  • Legacy equipment and communications systems in the field
  • Standards are not fully developed – the PFS provides feedback to standards organizations to help address any gaps
Additional Information

- Connected Vehicle Pooled Fund Study
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