

# AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

## Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. **Sponsoring DOT (State):** Florida Department of Transportation (FDOT)

2. **Name and Title:** Raj Ponnaluri, PhD, PE, PTOE, PMP

**Organization:** FDOT

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**State:** Florida

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**Phone:** 850-410-5616

**Fax:** Not Applicable

## Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. **Name of the innovation:**

Deployment of Connected Vehicle (CV) Technologies and Security Credential Management System (SCMS).

4. **Please describe the innovation.**

The *Interstate 75 (I-75) Florida's Regional Advanced Mobility Elements (FRAME)* project deploys connected vehicle (CV) technologies and applications along the I-75 corridor in Alachua County and adjoining arterial corridors to implement connected vehicle-based integrated corridor management (ICM) technologies. The goal of the project is to improve travel time reliability, safety, throughput, and provide traveler information. The project also deploys pedestrian and bicyclist safety applications. The *Gainesville Signal Phase and Timing (SPaT) Trapezium* project deployed CV technologies and applications along four arterial corridors forming a trapezium surrounding the University of Florida main campus in Gainesville to showcase the potential of Connected and Automated Vehicle (CAV) technologies in improving safety and mobility for all modes of transport including pedestrians and bicyclists. The *Security Credential Management System (SCMS)* is a certificate-based validation and security process that verifies that a CV message (e.g., basic safety message, traveler information message, etc.) is sent from a trusted entity and rejects messages from unauthorized entities. Florida is one of the first states to deploy a statewide SCMS platform.

5. What is the existing baseline practice that the innovation intends to replace/improve?

The existing baseline practice does not support the technology for emergency vehicle preemption, transit signal priorities, traveler information, or applications for enhanced bike-ped safety along project corridors. There was no statewide SCMS platform to ensure the CV devices are interoperable and interchangeable across jurisdictional boundaries.

6. What problems associated with the baseline practice does the innovation propose to solve?

The I-75 corridor in Alachua County, Florida experienced at least one full closure per direction every nine days and is one of the major freight routes in the state. The detour routes need to handle the detoured traffic by optimizing the delay. Again, the adjoining arterials to the I-75 corridor need to provide quick access for first responder vehicles to get to the incident scenes. The traffic signals were not equipped with preemption technologies to be leveraged by the first responder agencies. The high activity of pedestrians and bicyclists on the arterials around the University of Florida campus needs more pedestrian and bicyclist technology-focused solutions for enhanced safety of the non-motorized traffic. The proposed solution will disseminate traveler information messages with detour instructions in real-time which will reduce the severity and frequency of secondary crashes on the I-75 corridor. Also, with emergency vehicle preemption technologies deployed on the 17 fire trucks belonging to the City of Gainesville Fire Services, the deployed technological solutions will enable the first responder agencies to arrive at incident scenes quicker. The transit signal priority application on 10 Gainesville Regional Transit System (RTS) buses will help the City to maintain its transit schedule. The bicycle and pedestrian safety applications will send alerts to the equipped vehicles and warn them if they are in a collision course. A

bad actor may interrupt the functions of CV devices by getting access and potentially causing disruption to a wider network if the security is not ensured. The SCMS platform will provide certificates to sign the connected vehicle messages for secured exchange between CAV devices.

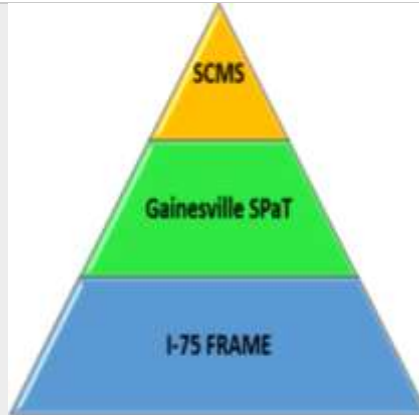
7. Briefly describe the history of its development.

FDOT has adopted its CAV Business Plan (BP) to steer the state's CAV program. The CAV BP identifies the deployment of CAV projects and infrastructure readiness as one of the focus areas. I-75 FRAME and Gainesville SPaT Trapezium projects were developed and implemented on the foundation laid out in the CAV BP. Apart from that, the frequent crashes on the I-75 corridor and consequent lane-closures gave rise to the need for an ICM approach to ensure safety and mobility. To address these needs, I-75 FRAME and Gainesville SPaT Trapezium projects were developed. The CAV BP also identifies the physical and electronic security as an action item for secured operation of the CAV projects. The need to provide a secure CAV operational environment was the driving force for the statewide deployment of SCMS.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

To support the deployment of CAV devices the FDOT has developed a developmental specification for the RSUs. This can be found [here](#). FDOT's CAV Program webpage contains summary details of these initiatives. I-75 FRAME: <https://www.fdot.gov/traffic/its/projects-deploy/cv/maplocations/i75-frame.shtm>; Gainesville SPaT Trapezium: <https://www.fdot.gov/traffic/its/projects-deploy/cv/maplocations/gains-trapezium.shtm>; SCMS: <https://www.fdot.gov/traffic/its/projects-deploy/cv/maplocations/scms>.

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.




## State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The All selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

- Prototype is fully functional and yet to be piloted
- Prototype has been piloted successfully in an operational environment
- Technology has been deployed multiple times in an operational environment
- Technology is ready for full-scale implementation

The I-75 FRAME and Gainesville SPaT projects are operational with a total of 128 RSUs and 81 OBU. The SCMS is also operational and all CAV projects in FL is being gradually enrolled into the SCMS platform.

10. What additional development is necessary to enable implementation of the innovation for routine use?

The I-75 FRAME involved testing through the FDOT's Traffic Engineering Research Laboratory (TERL) and an FDOT Traffic Control Device Permit application. In mid-2018, project teams used the TERL facilities for testing the functionality of CV equipment from various manufacturers. The teams were judged on their ability to integrate with existing signal controllers and perform CV applications. The Gainesville SPaT included scope for value-added propositions from potential vendors. Including the desired services in the value-added (optional) services allowed the vendors to offer more services. This allowed the FDOT to choose from many options and consider potential future technological enhancements. By including these features, the project later benefited by achieving a wide range of services that were initially thought to be difficult to achieve within the budgeted cost. The FDOT selected its statewide SCMS vendor through a competitive procurement process. SCMS ensures that messages between CV equipment, i.e., roadside units and on-board units, are from trusted sources and the messages are unaltered. I-75 FRAME and Gainesville SPaT messages are trusted and secure messages with the SCMS. The FDOT prepared a scope with detailed requirements after working with subject matter experts. The FDOT selected a vendor to provide all the elements for the statewide platform for three years. In other words, the statewide SCMS is software as a service (SaaS).

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology??  Yes  No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
Pinellas County	Kenneth A Jacobs	727.464.8928	kjacobs@co.pinellas.fl.us
City of Gainesville	Emmanuel Posadas	352.393.8429	PosadasEP@cityofgainesville.org

## Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

I-75 FRAME met the stakeholder needs because it allowed for equipment to be tested. Evaluators determined the vendor based on its performance. By conducting preliminary testing, the stakeholders knew what equipment worked with their traffic signal controller and CV applications. The FDOT had some ideas for its Gainesville SPaT project with the base package. The value-added allowed vendors to propose more innovative services for an economical price. The stakeholder needs were met with enhanced performance and reasonable budget. For SCMS, procuring the platform as a SaaS helped the FDOT secure a statewide system for a fraction of the cost.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Improved Operation Performance	The I-75 FRAME project teams were judged on their ability to integrate with existing signal controllers and perform CV applications.
Cost Savings	With the value-added section in the Gainesville SPaT, the FDOT procured additional services from the vendor that was not part of the base package. The request for proposal (RFP) was estimated for \$1.2 million. The base package resulted in \$462,000, and the value-added service package was \$513,000. The FDOT was able to save \$226,000.
Cost Savings	The SCMS was procured as a SaaS which proved to be cost effective for the FDOT as a statewide platform.
Improved Safety	Improving safety and mobility is the core objective of the deployed CAV technologies. The CAV technologies will provide advanced information, alerts, and messages to the motorists to assist with situational awareness.
Improved Operation Performance	The mobility applications will take motorist inputs through active and passive sensors to provide equitable travel time while optimizing delay.

Provide any additional description, if necessary:

Not applicable

14 How broadly might this innovation be deployed for other applications in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

States or local agencies that are deploying emerging transportation technology can use the same approaches from these projects. Consider preliminary testing of equipment on existing traffic controllers within an experimental laboratory like the FDOT's TERL. Include value-added sections for vendors to propose services or products that were not included or considered in the base package. Deploy a statewide SCMS platform as a SaaS.

## Market Readiness (20 points)

The All selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
<input checked="" type="checkbox"/>	Gaining executive leadership support	Executive leadership support is vital for such innovative technology deployments, especially, CAV applications, and SCMS
<input checked="" type="checkbox"/>	Communicating benefits	Communicating benefits properly is also vital. The benefits of CAV applications may seem to be small at the onset as the full benefits will be realized when there is wide proliferation of the connected and automated vehicles. However, benefits of SCMS can be immediately realized.
<input checked="" type="checkbox"/>	Overcoming funding constraints	Funding was dedicated to these projects. There was careful planning with executive leadership to fund these projects.
<input checked="" type="checkbox"/>	Acquiring in-house capabilities	The RFPs were developed in-house with consultant support. All of these projects will be implemented through a competitive procurement.
<input type="checkbox"/>	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
<input type="checkbox"/>	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.



<input type="checkbox"/>	Other challenges	Click or tap here to enter text.
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16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

**I-75 FRAME**

- a. **Cost:** \$2,491,000
- b. **Level of Effort:** Installation began along I-75 before transitioning onto local arterials. Once the vendor completed a few installations and became familiar with the equipment, their crews installed three to five interstate RSUs daily. Installation at intersections requiring lane closures took slightly longer. I-75 FRAME is comprised of 101 roadside units.
- c. **Time:** From April 2019 to May 2020

**Gainesville SPaT**

- a. **Cost:** \$975,000
- b. **Level of Effort:** Gainesville SPaT is comprised of 27 roadside units. The level of effort has been moderate because of coordination with stakeholders and the vendor.
- c. **Time:** From May 2018 to September 2019

**SCMS**

- a. **Cost:** \$95,000
- b. **Level of Effort:** The vendor provides a turnkey statewide SCMS platform in the form of SaaS. Except for coordinating projects for enrollment or providing some technical assistance, the level of effort has been minimal.
- c. **Time:** From October 2018 to March 2020 (RFP development to executed contract)

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

The implementation of all the innovations involved vendors, contractors, and consultants. For I-75 FRAME, the FDOT procured material directly, while their system manager consultant developed project plans, details, and specifications to advertise a construction project to install the furnished devices. The Gainesville SPaT also used a vendor selected from a competitive procurement. For I-75 FRAME and Gainesville SPaT, the vendors had experience with intelligent transportation systems, configuration, integrated traffic signal controllers, and traffic management centers. The selected vendor for the statewide SCMS operates the platform. The FDOT used consultant support to develop the RFP.