Miami-Dade Transportation Planning Organization

April 2023

MIAMI-DADE TRANSPORTATION PLANNING ORGANIZATION

CONNECTED AUTONOMOUS VEHICLE STRATEGIC PLAN

EXECUTIVE SUMMARY

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Introduction

Connected and automated vehicles (CAV) are emerging technologies that can reshape the transportation system and urban landscape of Miami-Dade County. They will likely improve safety, increase network efficiency, and reduce congestion but also pose potential risks and challenges. The Miami-Dade Transportation Planning Organization (TPO) and Miami-Dade County are planning for and investing in building a more multimodal transportation system. The TPO is addressing the incorporation of CAV technologies into its short-, mid-, and long-term planning processes by developing this CAV Strategic Plan. The study process involved partner agencies via a Study Advisory Group (SAG) and the public via a Vision Workshop. The SAG included staff from the Miami-Dade Department of Transportation and Public Works (DTPW), educational institutions, private sector industry members, and other local agencies.

The Miami-Dade CAV Strategic Plan relies on future scenarios to better understand how new technologies could change travel and support or undermine the TPO's and its partners' goals. The process yielded two overarching conclusions: continuing support for the DTPW CAV Vision Statement, which seeks to leverage CAV technologies in ways that support the county's commitment to a multimodal transportation system, and the need to plan for and leverage CAV and related technologies with a holistic and integrated perspective and partnership. This study recommends the development of a SMART CAV Concept of Integrated Operations (CIO) to orchestrate planning for and operating Miami-Dade's multimodal network. The centerpiece of the CIO is a partnership among network owners and operators. The foundation of the CIO is to create a partnership to guide the development of the CIO and pilot projects that can explore how CAV and other technologies could impact travel along multimodal corridors and in multimodal centers. These actions will help ensure that agencies and partners in Miami-Dade County are well-positioned to embrace the opportunities and challenges of the integrated deployment of CAV technologies.

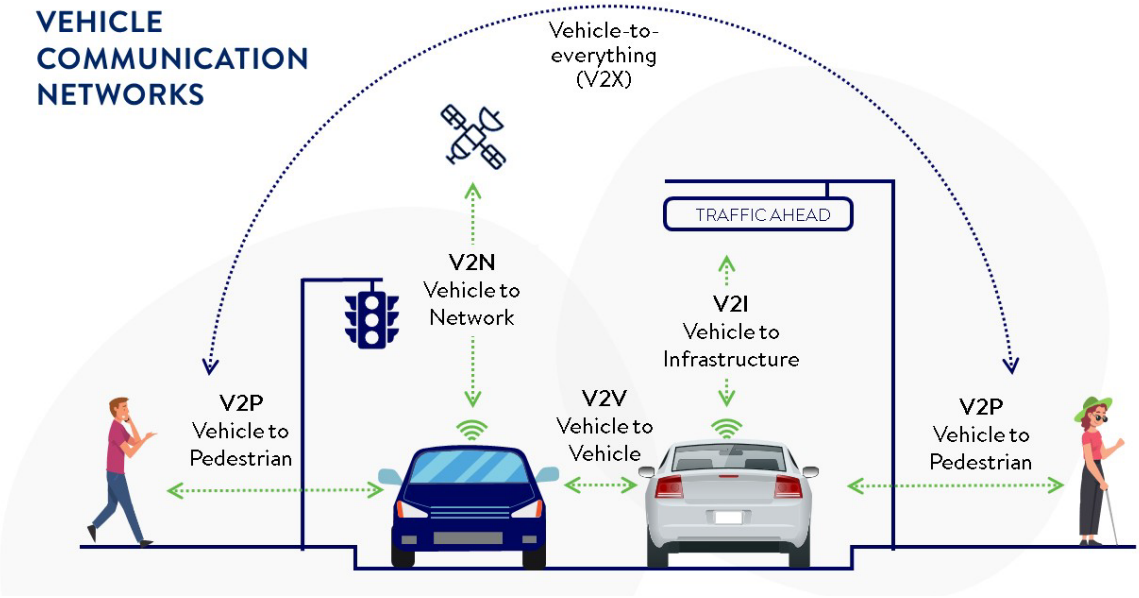
CAV and Other Transformative Technologies

This study uses connected and autonomous vehicles (CAV) as an all-encompassing term for technologies related to vehicle communication and automation. Other related technologies, such as vehicle electrification, e-commerce, delivery vehicles, and telework, are also emerging or are in the preliminary stages of development and may significantly impact the transportation system.

Connected Vehicles

Connected Vehicles (CVs) can communicate with one another and the surrounding infrastructure using decades-old over-the-air (OTA) transmission technology and protocols. V2V networks are made up of OTA communication nodes with cars connected with one another. V2X is a term that encompasses all manner of communication by connecting vehicles to a variety of recipients. CV safety and mobility applications overcome the physical limitations and distraction errors of humans behind the wheel and have the potential to dramatically reduce the number of fatalities and serious injuries caused by accidents on our roads and highways.

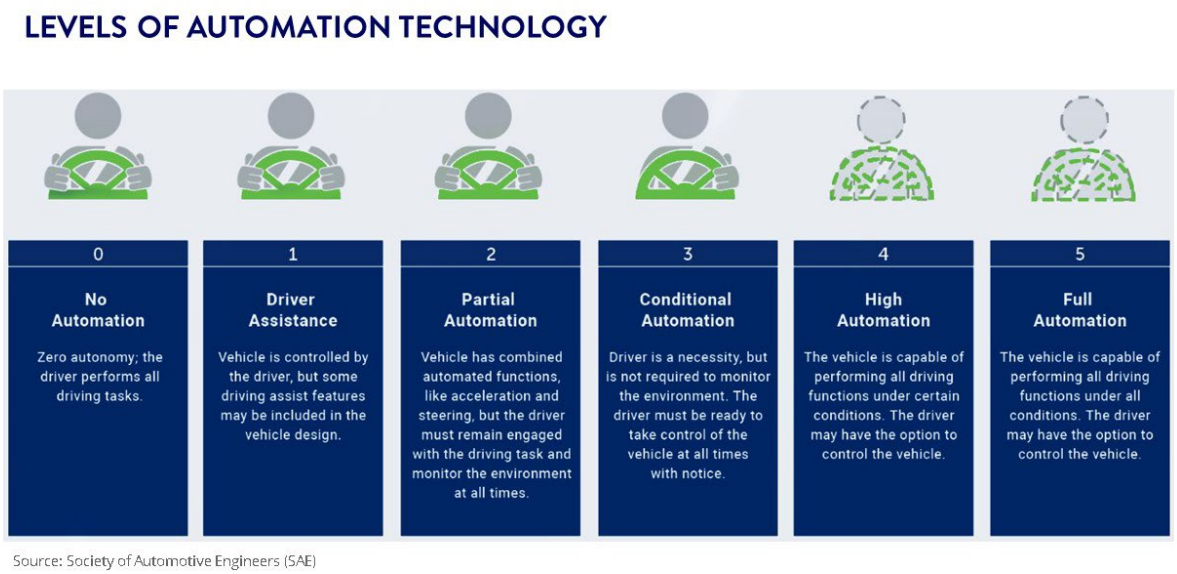
Figure 1 Connected Network Vehicle Ecosystem



Automated Vehicles

Automated vehicles are vehicles in which some aspects of a safety-critical control function occur without direct driver input. The Society of Automotive Engineers (SAE International) defined five distinct levels of autonomy. Level 4 and 5 capabilities are considered in many AV analyses and serve as a threshold upon which significant personal or freight travel changes would occur.

Figure 2 Levels of Autonomy and Driving Automation System

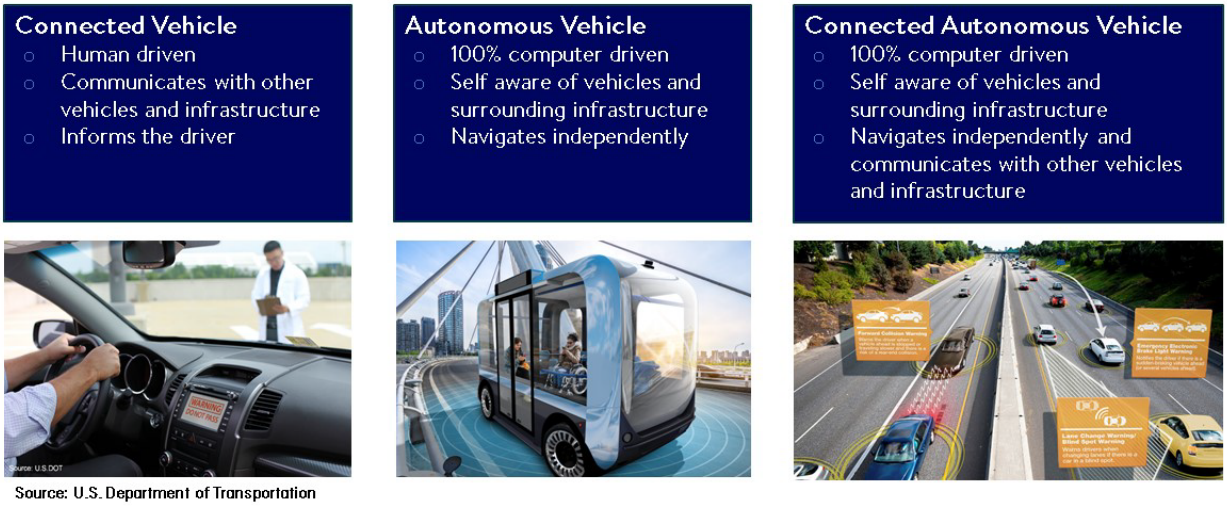


Source: Society of Automotive Engineers (SAE)

Connected-Automated Vehicles

CAVs leverage automated and connected vehicle technologies to harvest the benefits of advanced in-vehicle sensors with V2V, V2I, and V2X communications. CV connectivity is critical in realizing automated vehicles' full potential benefits and adoption.

Figure 3 CAV Technologies



Source: U.S. Department of Transportation

Other Transformative Technologies

Emerging technologies such as electric vehicles, telework, mobility-as-a-service, and e-commerce are already available and significantly impact transportation. It is essential to identify and include these technologies in plans to prepare for their transformative impacts.

Electric vehicles (EVs) are becoming increasingly popular due to their lower emissions and operating costs than traditional gasoline-powered vehicles. Telework is becoming more prevalent due to technological advances and changing attitudes toward work-life balance. Mobility-as-a-Service (MaaS) is integrating various modes of transportation into a single platform, and increasingly popular, convenient, and accessible E-commerce and autonomous delivery vehicles are also impacting how people move. These technologies have the potential to reduce carbon emissions from transportation significantly.

This has led to an increase of delivery vehicles on the roads, which can contribute to congestion and emissions. Autonomous vehicles are being used for deliveries, mobility analytics is being used to optimize transportation systems, Urban Air Mobility (UAM) is using aircraft for short-distance transportation, and Personal Rapid Transit (PRT) is using small, automated vehicles to transport passengers on demand. These technologies can reduce travel times and provide more personalized transportation options.

Study Process and Key Findings

A Study Advisory Group (SAG) was created at the outset of this study to ensure continued coordination and alignment. The SAG included representatives from government agencies, industry experts, and private sector representatives. Additionally, a vision workshop was held to hear from public and local government agency staff on the proposed scenarios. Scenario planning involves developing and analyzing differing

outcomes to inform decision-making and planning. The scenarios explored the risks, challenges, and opportunities of existing and possible technologies across all modes of travel.

The four scenarios vetted through a public workshop included Trend, Smart Roads and Vehicles, Smart Transit, and Smart Infrastructure. Each scenario builds on the previous one, demonstrating a technology adoption and implementation progression over time, with 2050 as a horizon year. Discussions with the SAG and input from the workshop yielded two key findings: continued support for leveraging technologies to support the County's multimodal transportation system goals and achieving that vision by integrating the County's management and operations. The key challenge to integrated management and operations is overcoming the fragmented ownership and operations of the County's multimodal network.

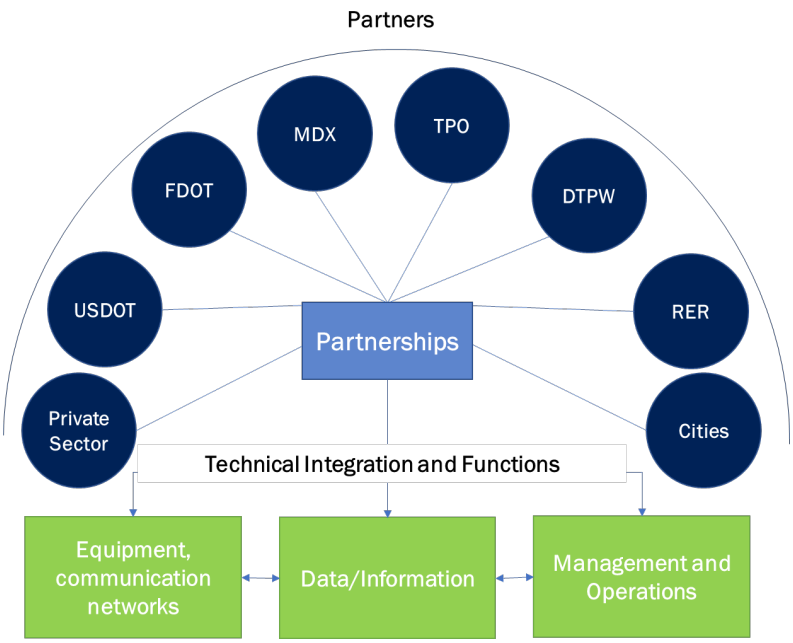
The findings resulting from the workshops and scenario planning are summarized as follows:

1. Technologies should be developed and invested across all travel modes (not just roads and cars, but transit, walking, biking, etc.).
2. Technologies should be implemented and orchestrated through an integrated management and operations partnership and approach.
3. Integrated management and operations should be guided by system-level performance goals and metrics (not traditional mode-specific, facility segment-based goals and metrics).

SMART CAV Concept of Integrated Operations

The CAV Strategic Plan recommends the development of a SMART CAV Concept of Integrated Operations (CIO) to orchestrate planning for and operation of Miami-Dade's multimodal network in relation to connected and autonomous vehicles and related technologies. The CIO consists of seven top-level strategies, ranging from short-, mid-, to long-term implementation, that align with the Plan's key findings. The foundation of the CIO lies in the first three **short-term** strategies: the SMART CAV Partnership, Plan, and Monitoring System. The first of the three short-term strategies is the centerpiece of the CIO; it is a multiagency partnership guided by a multimodal system-level planning framework (Figure 4). The partnership will oversee the integration of equipment, communications, information, and data.

Figure 4 SMART CAV Partnership



The **mid-term** strategies focus on scaling up the CIO and implementing technologies. The **long-term** strategies focus on ensuring the long-term sustainability and effectiveness of the CAV system. Figure 5 and Table 1 provide an overview of the CIO strategies, the planned structure, objectives, timeframe, and recommended partners.

Figure 5 Summary and planned structure of CIO Strategies

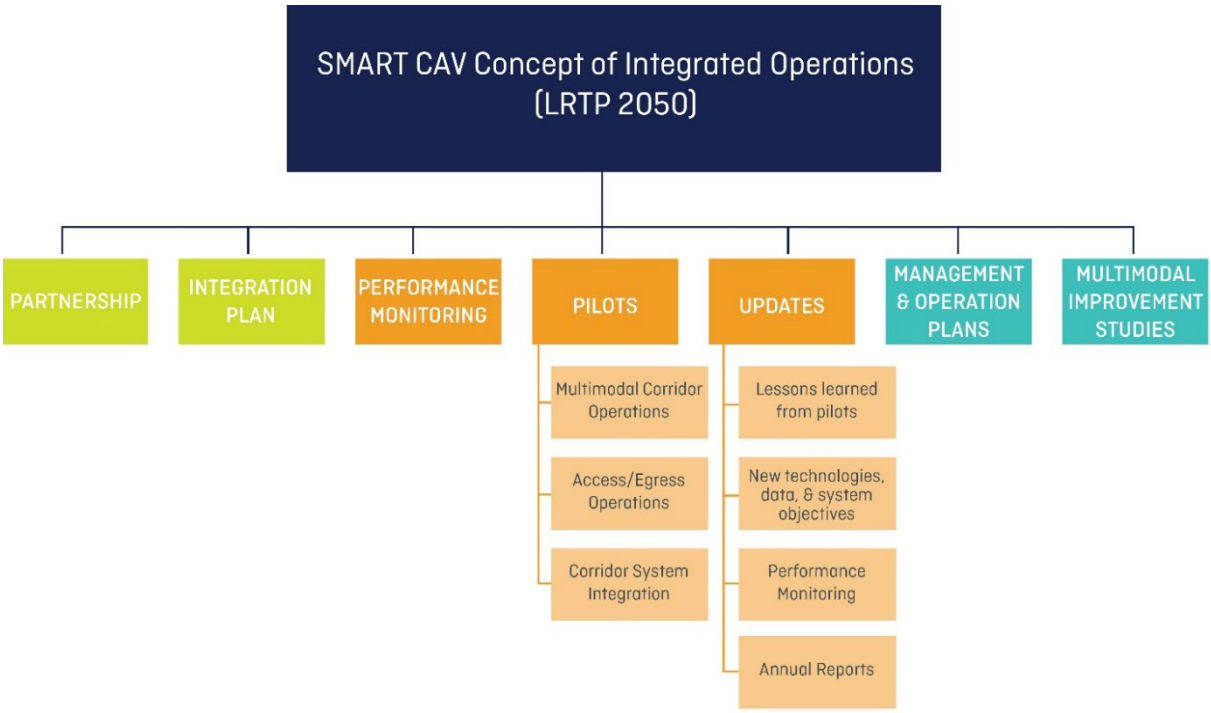


Table 1 Summary of the SMART CAV Concept of Integrated Operations Strategies, including objectives, duration and timeline, and partners.

	Strategy	Strategy Objective	Duration/Time Frame	Partners
	SMART CAV Partnership	Create partnerships among the government and private sector to guide the planning and implementation of system integration.	Short-term	FDOT, MDX, DTPW, RER, private interests, TPO, cities
	SMART CAV Plan	Create a Plan that identifies how to integrate existing and near-term technologies, operations, data, and information.	Short-term	Smart CAV Concept of Integrated Operations Partnership
	SMART CAV Monitoring System	Develop a multimodal monitoring system to track system performance (augmenting the congestion management system).	Short-term	FDOT, MDX, DTPW, private interests, TPO, cities
	CIO Corridor Pilot Project	Evaluate multimodal corridor using system performance measures and recommend improvements in mid-term management and operations strategies.	Mid-term	DTPW, TPO

	Access / Egress Pilot Study	Evaluate access/egress performance and recommend operational improvements in selected multimodal corridor (i.e., existing Metro station area).	Mid-term	DTPW, RER, TPO
	Long Range Pilot Project	Develop and evaluate long-term corridor technology scenarios in multimodal corridors.	Mid-term	DTPW, FDOT, RER, TPO
	Plan Updates	Update SMART CAV with new technologies, data, and system objectives.	Mid-term and Long-term	DTPW, RER, TPO
	Performance Monitoring Updates	Update performance monitoring with new technologies, data, and system objectives.	Mid-term	DTPW, RER, TPO
	Annual Performance Monitoring Reports	Generate annual reports to track trends and the performance of improvements	Short-term, Mid-term and Long-term	DTPW, RER, TPO
	Management & Operations	Conduct a system integration management and operations plans as needed throughout the county using the lessons learned from the pilot studies.	Mid-term and Long-term	DTPW, RER, TPO
	Multimodal Improvement Studies	Conduct integrated multimodal improvement studies will be conducted in the county using the lessons learned from the pilot studies.	Mid-term and Long-term	DTPW, FDOT, MDX TPO, cities