CONNECTED & AUTOMATED VEHICLES

WHY IT MATTERS

Private companies producing automated vehicles (AVs) and connected vehicles (CVs) are investing billions in a race to market. New consumer products promise to fix intractable transportation challenges and make our lives easier. New business models in mobility are introducing market-based services and transforming travel behavior. Vehicles that are increasingly automated and connected have the potential to change personal, freight, and public transportation profoundly. Some impacts of those vehicles can be foreseen, others are uncertain, and all are complex.

In spite of that uncertainty, the transformational nature of AV and CV technology argues that public agencies should consider the strategies and possible outcomes to effectively manage public interest concerns. Overseeing the deployment of AV and CV technologies is a natural extension of the longstanding role of government to:

- Ensure safe and efficient operation of public roadways.
- Foster equity across users of the system.
- Mitigate negative effects of transportation.[1]

DEFINITIONS/TECHNOLOGY

Connected and automated vehicles (CAVs) are two separate but related advancements in transportation technology. A vehicle can be connected but not automated, automated but not connected, neither or both, and it is important to understand these distinctions.

Connected vehicles are those that can communicate with other vehicles (V2V), infrastructure (V2I) and devices (V2D) through wireless network technology, such as Wi-Fi and radio frequencies. Vehicle-to-Everything communications, or V2X, is the umbrella term for the communication systems contained within the connected vehicle network. These systems can sense the transportation environment around them and collect and share real-time information to alert drivers to nearby incidents, diversions, or heavy traffic, thereby improving transportation safety and mobility.

Automated vehicles, also known as driverless cars, are vehicles equipped with technology that enables them to operate with little to no human assistance. These vehicles can drive themselves by using cameras, radar, lidar (image sensing), GPS and computer vision to sense their surroundings. Once an environment has been scanned and obstacles and relevant signage detected, the vehicle's equipment reacts as the situation dictates, controlling the steering mechanism, accelerator and brakes as required. Currently, there are no fully automated vehicles on the market; there are, however, vehicles that include connected and automated features that allow them to operate somewhat autonomously but still require the driver to be actively involved. There are six levels of automation, as defined by the Society of Automotive Engineers (SAE).[2]

CONSIDERATIONS FOR LOCAL GOVERNMENTS

Local governments will want to consider how the effects of AV and CV technologies can contribute to broad community goals. Given the growing public and media interest in AVs and CVs, decision makers can leverage this interest toward prudent support of testing and deployment by aligning policy actions with goals that represent societal interests. This is particularly important where investment of public resources is at stake. Associated strategic planning activities undertaken at a high level may include:

- Identification of transportation and societal goals and objectives that may be achieved through AV and CV technologies.
- Development of performance measures that support specific safety, congestion, mobility, and environmental goals that may be supported by AV and CV systems and can be used to track the results of testing and investment in these systems over time.
- Setting the general parameters under which CV and AV deployment can be facilitated to achieve agency and societal goals.
- Contributions toward building the business case for investing in CVs, generating support for adoption of safety and mobility applications, and promoting incentives for producers to improve applications and technology. [3]

Local governments have led and funded initiatives, formed public-private partnerships with formal agreements that advance local priorities and allowed private sector programs to run on local roads with no written agreements. These programs have focused – and are focusing – on not only single occupancy vehicles but also automated shuttles and connected vehicle applications for transit, freight, and emergency vehicles.[4]

Cities first need to assess existing laws and municipal codes that will impact any deployment of AV technology. With technology like AVs, cities need to get the right people to the table, which includes urban planners, public works, information technology, procurement policy, and law enforcement. Modifications to existing codes may be appropriate, or cities may have to think about the development of a new autonomous vehicles or smart infrastructure code.

Cities should engage in an open dialogue between all their residents and respond to varying levels of acceptance of this technology. This outreach should not be a one-off prior to introduction of AVs, but ongoing as new concerns emerge.

Cities should continue to stay informed and engaged by reaching out to their state and federal partners on this issue.

Cities should not only encourage [investment in CAV infrastructure], but become an active investment partner. Cities can try to negotiate matching loans from state infrastructure banks or other financing vehicles to match any local investment in this infrastructure. Besides the obvious benefits of greater investment towards these mobility technologies, the added investment on the part of cities puts their skin in the game and empowers cities to have more of a direct say over implementation, both on a municipal and regional scale.

Municipal leaders should consider their short and long-term infrastructure needs and ensure that any new investments better position their cities to support and integrate autonomous vehicle technology. This will include efforts to invest in data storage and processing capacity, investing in sensor networks and broadband, and ensuring that streetscapes and right of ways can best accommodate AVs. As new patterns of transit evolve, cities should preserve flexibility in planning. Smart planning and collaboration now across all sectors for infrastructure needs will help ensure the safe, effective, and efficient deployment of AVs in ways that enhances the benefits for all residents.[5]

CURRENT STATUS & FUTURE DIRECTIONS

Smart Columbus Connected Vehicle Environment

A connected vehicle environment will allow vehicles and traffic signals to “talk” to each other, alerting drivers to potential hazards, allowing emergency vehicles to move through intersections quicker, and enabling traffic managers to adjust operations.

US 33 Smart Mobility Corridor

The installation of a 35-mile, 432-strand fiber network along US 33 and Industrial Parkway (forming a redundant loop) was completed in 2020. This fiber network allows automotive testing, R&D, and manufacturing facilities to test smart transportation and autonomous vehicle technologies on US 33.

Connected Marysville

As a component of the 33 Smart Mobility Corridor project, the City of Marysville has upgraded all 27 traffic signals in the City and equipped them with Dedicated Short Range Communication (DSRC) radios for use as Road Side Units aimed at delivering Signal Phase and Timing data and other safety messages to vehicles that have been outfitted with On-Board Units (OBUs).

In addition to the deployment of traffic signal upgrades, project partners have also committed to equipping 800 to 1,000 vehicles with OBUs. The goal is to create a real-world environment where companies, governmental agencies, and academia can develop and test smart technology throughout the entire City in a real-life environment.

DriveOhio City Use Cases

Discussions are actively underway with Athens, Akron, Canton, Cincinnati, Cleveland, Dayton, Dublin, Fairlawn, Lima, Monroe/Middletown, Springboro, Springfield, Toledo, Urbana, Xenia and Youngstown for additional projects. Use cases that highlight each city’s unique attributes are under development, ranging from workforce mobility, healthcare and education access, and mobility access for underserved, elderly and disabled populations. Project plans are being developed utilizing potential technology-enabled solutions ranging from autonomous shuttles, autonomous and connected vehicle testing, connected infrastructure and other smart mobility endeavors.

Smart Mobility Ecosystem in Dublin

Denso announced that it is investing $1.42 million to launch a smart mobility ecosystem in Dublin, Ohio, designed to enhance transportation. In the project, Denso is working with a coalition of municipal, state, business, and academic partners to test and implement infrastructure technologies, create value-added mobility services, and gather previously untapped data the company says are vital to increasing road and pedestrian safety and reducing travel times.[6]

CASE STUDIES

Ann Arbor, Michigan

Ann Arbor Connected Vehicle Test Environment (AACVTE)

AACVTE is the largest operational, real-world deployment of connected vehicles and infrastructure in the world. The University of Michigan Transportation Research Institute (UMTRI) and its partners built upon an existing model deployment to become the standard for a national implementation.

New York City

NYC Connected Vehicle Project

The NYC deployment is primarily focused on safety applications – which rely on vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and infrastructure-to-pedestrian (IVP) communications. These applications provide drivers with alerts so that the driver can take action to avoid a crash or reduce the severity of injuries or damage to vehicles and infrastructure.

The goal of this project is to show that the benefits justify the sustainability of the operation and will encourage others to outfit their vehicles thus increasing the benefits to all.

Tampa, Florida

THEA Connected Vehicle Pilot

The Tampa Hillsborough Expressway Authority (THEA) and its partners are debuting innovative connected vehicle technology in Tampa's Downtown. THEA has equipped 10 buses, 8 streetcars and the cars of 1000+ individual volunteers with CV technology to make downtown Tampa a safer, smarter place to walk, ride and drive.

Las Vegas, Nevada

Las Vegas Innovation District

To date, 14 traffic signals within the region have been instrumented with DSRC, with the data integrated into the regional traffic system. The city is developing a connected corridor project that will install 24 additional DSRC radios in the downtown Innovation District.

EXAMPLE POLICIES

Maricopa County, Arizona

Building a Stronger Maricopa County

Target: By the end of FY 2022, the Department of Transportation will upgrade 50% of traffic signal controllers to support connected vehicle technology and expand the related communication infrastructure to improve transportation safety.

SCOPING & COST ESTIMATING

Local governments should assess their current procurement policies, and look specifically at whether these policies might inadvertently erect any roadblocks to purchasing the technology and smart infrastructure necessary to support AV deployment. There is an inextricable linkage between technology and city operations, and there has been a rapid advancement of technology over the past decade that has left many city governments without a clear procurement path for incorporating new technology into cities in a transparent manner.

Cities should ensure that the parameters around which kinds of proposals they can accept and who they can offer contracts to do not prohibit them from working with the new technology companies that provide the infrastructure and platforms to support AV technology. There are many new innovative contracting models being used by public agencies seeking to promote more collaborative procurements, while respecting the needed transparency when public dollars are being used on a project. This is an area where both the private and public sector should continue to collaborate.[7]

APPLICABLE LAWS & REGULATIONS

Executive Order 2019-26D Re-establishing DriveOhio as the Statewide Center for Smart Mobility

Executive Order 2018-04K Establishing Guidelines for Testing Autonomous Vehicles

Ensuring American Leadership in Automated Vehicle Technologies: Automated Vehicles 4.0 (AV 4.0) builds upon Preparing for the Future of Transportation: Automated Vehicles 3.0 (AV 3.0) by expanding the scope to 38 relevant United States Government (USG) components which have direct or tangential equities in safe development and integration of AV technologies. AV 4.0 is structured around three key areas:

1. *USG AV Principles*
2. *Administration Efforts Supporting AV Technology Growth and Leadership*
3. *USG Activities and Opportunities for Collaboration*

AV 4.0 seeks to ensure a consistent USG approach to AV technologies, and to detail the authorities, research, and investments being made across the USG so that the United States can continue to lead AV technology research, development, and integration.

ORGANIZATIONS

National Association of Counties. https://www.naco.org/resources/featured/connected-autonomous-vehicles-toolkit

DriveOhio. https://drive.ohio.gov/

Intelligent Transportations Systems Joint Program Office (ITS JPO) https://www.its.dot.gov/index.htm

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[1] National Academies of Sciences, Engineering, and Medicine 2017. *Strategies to Advance Automated and Connected Vehicles.* Washington, DC: The National Academies Press. https://doi.org/10.17226/24873.
[2] National Association of Counties (NACo) 2019. *Connected and Automated VehiclesToolkit: A Primer for Counties.* https://www.naco.org/resources/featured/connected-autonomous-vehicles-toolkit
[3] National Academies of Sciences, Engineering, and Medicine 2017. *Strategies to Advance Automated and Connected Vehicles.* Washington, DC: The National Academies Press. https://doi.org/10.17226/24873.
[4] National Association of Counties (NACo) 2019. *Connected and Automated VehiclesToolkit: A Primer for Counties.* https://www.naco.org/resources/featured/connected-autonomous-vehicles-toolkit
[5] National League of Cities 2017. *Autonomous Vehicles: A Policy Preparation Guide.* https://www.route-fifty.com/media/nlc_automous_vehicles_policy_prep_guide.pdf
[6] https://www.autonomousvehicletech.com/articles/1922-smart-mobility-ecosystem-launched-in-dublin-ohio?
[7] National League of Cities 2017. *Autonomous Vehicles: A Policy Preparation Guide.* https://www.route-fifty.com/media/nlc_automous_vehicles_policy_prep_guide.pdf