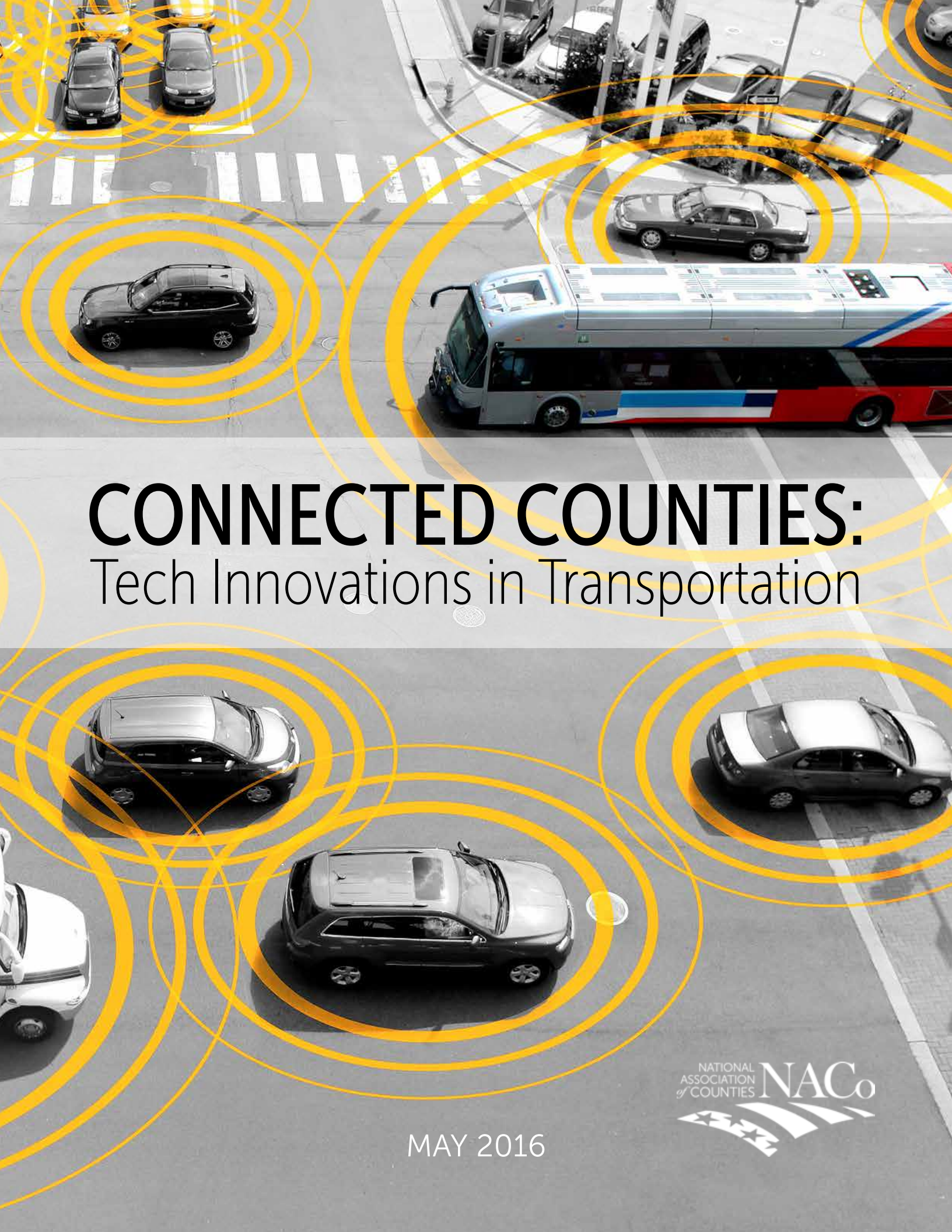


CONNECTED COUNTIES:
Tech Innovations in Transportation

NATIONAL ASSOCIATION of COUNTIES NACo

MAY 2016

TABLE OF CONTENTS

OVERVIEW

America's counties are innate innovators. They work continually to provide the best services and facilities they can for their residents. As public budgets are increasingly squeezed, local governments must continue to provide world-class service to improve local quality of life and promote economic competitiveness. To do so, county leaders must stay abreast of current practices and technological advances to leverage new opportunities to improve service delivery.

To ensure their communities are safe, affordable, attractive places to live and work, county governments build and maintain infrastructure to support efficient, safe, reliable and cost-effective passenger and goods movement. Indeed, counties invest more than $122 billion in building infrastructure and maintaining and operating public works annually. County governments own and maintain 45 percent of the nation's public roads, own approximately four out of every 10 bridges and are involved in 27 percent of public transit systems.[1] Additionally, counties are responsible for land use planning, environmental management, housing and public facilities investments, social services and economic and community development programs, all of which depend upon a reliable, efficient transportation system.

Since recent decades have seen significant advances in the integration of communication technologies into transportation infrastructure and vehicles, it is imperative that county officials, county engineers and transportation planners understand these advancements when making decisions about future needs. Technology manufacturers, software developers, auto companies, universities and many other professionals are imagining and testing a variety of techniques to optimize the nation's transportation system through the use of integrated technology, communications, vehicles and infrastructure. These breakthroughs are poised to revolutionize local and national transportation systems and could bring significant changes to the built environment and how residents live, work and move around the community.

Through selected case studies, this report features counties who are either: 1) creating policies to explore research and testing of connected and autonomous vehicle technology at the local level, or 2) conducting research and testing the technology and its application themselves and with federal and private-sector partners. While this study focuses primarily on the implications of driverless cars in passenger travel on roadways, this growing industry is poised to reshape transit and freight travel, as well.

Many questions still remain about how county governments should consider these opportunities when making decisions about needed infrastructure investments and creating long-term transportation and land use plans. This report, however, offers a starting point for how county leaders can begin to address these innovations in their communities.

WHAT ARE CONNECTED VEHICLES?

Connected vehicles (CV) are those that can communicate with other vehicles, infrastructure and devices through wireless network technology, such as global positioning systems (GPS), Wi-Fi and radio frequencies. Vehicles equipped with CV technology can alert drivers to nearby incidents, diversions or heavy traffic, thereby improving transportation safety and mobility. One of the most frequently used CV technologies is dedicated short-range communications (DSRC). DSRC systems work by providing a two-way wireless link between vehicles and roadside systems to transfer information over a specific radio frequency. They can be used for traffic light control, traffic monitoring, automatic toll collection, traffic congestion detection and emergency vehicle signal preemption of traffic lights, to name a few.

WHAT ARE AUTONOMOUS VEHICLES?

Autonomous vehicles, or driverless cars, are vehicles equipped with technology that enables them to operate without human assistance. They 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 autonomous vehicles on the market; there are, however, vehicles that include connected and autonomous vehicles features which allow them to operate autonomously at times but still requiring the driver to be actively involved. Similar to connected vehicles, autonomous vehicles may improve public safety and mobility and reduce emissions and fuel consumption through the optimization of driving patterns and speeds.

MARICOPA COUNTY, ARIZONA

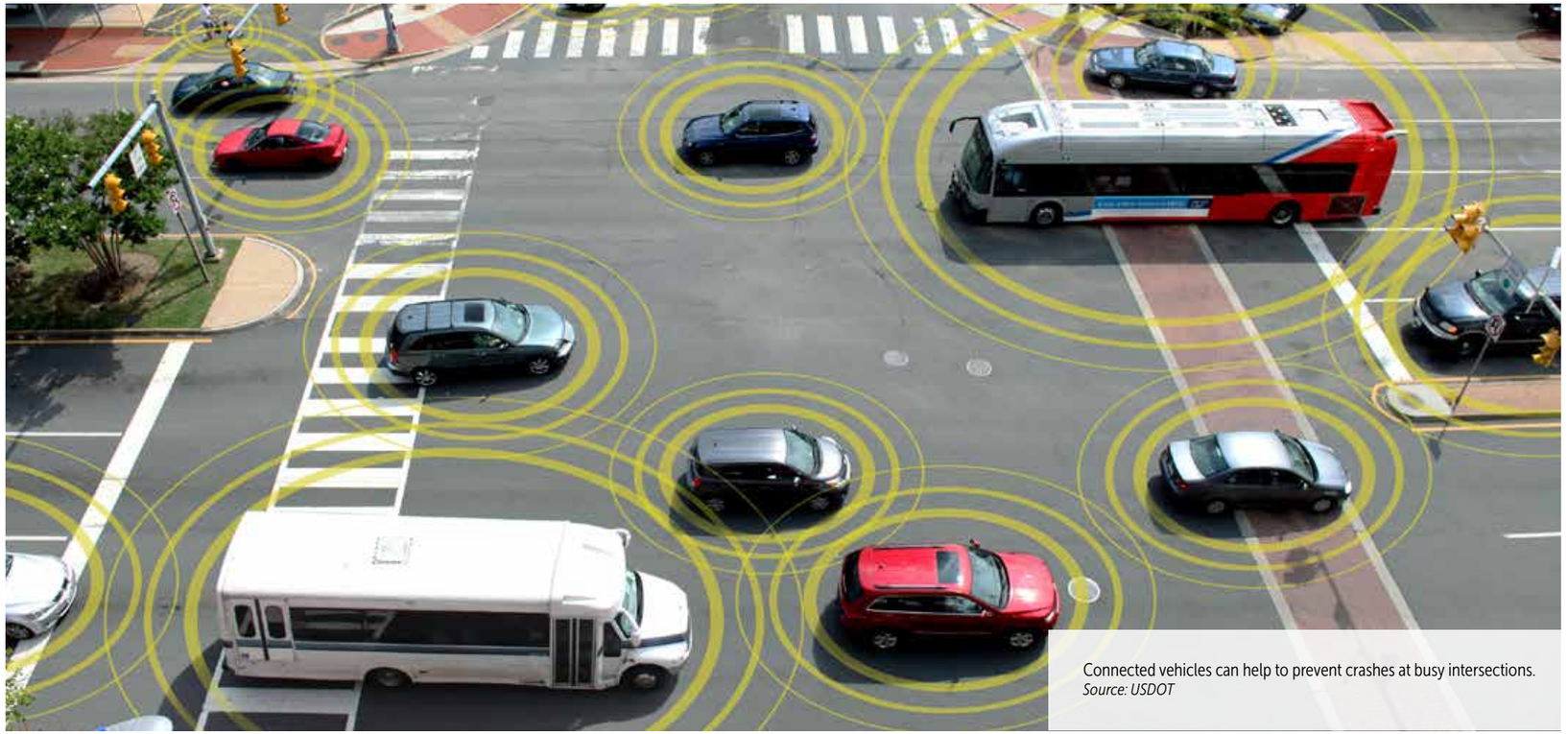
SMARTDRIVE PROGRAM

POPULATION: 4 MILLION
SQUARE MILES: 9,200

Maricopa County, located in central Arizona, is part of the Phoenix metropolitan area and covers just over 9,200 square miles, including 2,500 miles of roadways managed by the Maricopa County Department of Transportation (MCDOT).[2] MCDOT plans, constructs, operates and maintains roadways within the county's unincorporated areas, and is responsible for the operation and maintenance of 78 bridges, 340 culvert crossings, 143 traffic signals and more than 50,000 traffic signs.

Since 2006, MCDOT has been involved in the study of connected vehicle technology as part of the US Department of Transportation's (USDOT) Intelligent Transportation Systems (ITS) Connected Vehicles Initiative. Through the operation of a national connected vehicle affiliated test bed, in Anthem, Ariz., MCDOT and its partners research arterial management, or the management of major roadways with high traffic levels, with a particular focus on traffic signal operations.[3] The test bed is one of the two national deployment sites funded by the Connected Vehicle Pooled Fund Study's Multi-Modal Intelligent Traffic Signal System program, which seeks to integrate vehicles with SMART, or Systematically Managed Arterial, roadway systems through connected vehicle technology.[4]

The MCDOT SMARTDrive Program℠ began with a focus on emergency vehicles. Across all emergency disciplines, the most likely place for an emergency vehicle to be involved in a collision with another vehicle is at an intersection. Additionally, on average, 25 percent of all firefighter fatalities are response or roadway scene related. After further researching this topic, MCDOT identified incident response time and the safety of emergency responders as key areas of improvement. The county then began to look into the application of connected vehicle technology as a way to improve traffic signal preemption technology.[5]



Connected vehicles can help to prevent crashes at busy intersections.
Source: USDOT

Most traffic signal Emergency Vehicle Preemption technology in the Maricopa County region is currently controlled through optical-based signals. Optical signals are not always the safest option, however, as problems can arise quickly. For example, obstructions may block the signal from reaching the traffic light, or confirmation may not be available when multiple emergency vehicles approach the same intersection at the same time. The application of connected vehicle technology to traffic signal operations could solve these issues as it has the capability of prioritizing emergency vehicles, as well as transit and freight vehicles and pedestrians, to decrease the likelihood of traffic incidents at signalized intersections.

In phase one of the MCDOT SMARTDrive Program℠, which ran from July 2009 to July 2012, MCDOT and its partners developed concepts for the traffic signal operations. They then tested these concepts at various locations, first in a lab at the University of Arizona, then in a parking lot at MCDOT, and finally at an isolated signal in Maricopa County. In phase two, which is currently ongoing, Dedicated Short Range Communications technology has been installed at 11 test sites throughout Anthem, Ariz., and in four testing vehicles. Phase three will include fully operational deployment of the technology, starting with emergency vehicles and then expanding to local transit. Currently, MCDOT is in the process of seeking funding from a variety of sources including CTS PFS and USDOT to support phase three.

> **"WE AS PUBLIC AGENCIES HAVE TO POSITION OURSELVES TO RESPOND QUICKLY TO THE FAST-PACED, CHANGING REALITY OF AUTONOMOUS AND CONNECTED VEHICLES TECHNOLOGY BECAUSE THESE VEHICLES WILL BE ON OUR ROADS SOON. AND, WE WILL NEED TECHNOLOGY, POLICIES AND REGULATIONS IN PLACE TO ADDRESS THEM."**
>
> *— Faisal Saleem, ITS Branch Manager, MCDOT*

Looking further to the future, MCDOT plans to expand its Connected Vehicle Program to include freight vehicles, commuters and pedestrians. Possible applications include:

- **Freight movement:** There is a large warehouse district in Maricopa County. By applying this tech to freight, MCDOT hopes to move traffic through the corridors with high freight truck volumes faster in order to improve economic productivity, and also enhance pavement life.
- **Commuting patterns:** Commuters are a huge part of the car culture of Maricopa County. Arizona Department of Transportation and MCDOT hope to use DSRC to improve mobility and safety by providing in-vehicle queue warnings and reduced speed alerts on I-17 freeway. The technology will also support the transition of commuters from the freeway to alternate routes along parallel arterials during incidents.
- **Pedestrian mobility:** Applications for pedestrian usage include a cell phone app that could be used both to call for a walk signal and receive countdown information. The intent behind these pedestrian applications would be to increase pedestrian safety and mobility, especially for the elderly, blind or otherwise physically challenged.

Maricopa County is continually strategizing to develop better transportation options. As Faisal Saleem, ITS Branch Manager for MCDOT, said, "We as public agencies have to position ourselves to respond quickly to the fast-paced, changing reality of autonomous and connected vehicles technology because these vehicles will be on our roads soon. And, we will need technology, policies and regulations in place to address them." Over the years, MCDOT's focus has increasingly shifted from moving cars to moving people. Its goal to improve the safety and mobility of Maricopa County visitors and residents, however, has stayed the same.

SANTA CLARA COUNTY, CALIFORNIA

INNOVATION CENTER

POPULATION: 1.9 MILLION
SQUARE MILES: 1,290

Located in the Bay Area south of San Francisco, Santa Clara County, Calif., includes 15 municipalities, including San Jose, Sunnyvale, Santa Clara and Palo Alto. The Santa Clara Valley Transportation Authority (VTA)—an independent special district created by the county and governed by a combination of county and city elected officials—provides congestion management and transportation options, including bus, light rail and paratransit services, to the citizens of Santa Clara County with a focus on community needs, sustainability and innovation. VTA has an approximately $380 million annual operating budget and is funded by a variety of mechanisms, including a voter-approved half cent sales tax that will last through 2036.[6]

In 2015, VTA created the VTA Transportation Innovation Center at its River Oaks headquarters to establish a physical location where it could design, test and showcase local innovations in transportation infrastructure. According to VTA's Chief Technology Officer, Gary Miskell, "The whole idea of the Innovation Center is to do two different things: to get people out of their cars and to improve the customer experience, thereby making life better for those people using transit, through the use of technology." Projects at the Innovation Center seek to answer the following questions: How can we help customers to better trip plan? How can we help them get to a station or bus stop more easily? How can we improve their experience at that station or bus stop? On that train or bus? How can we get residents and tourists to choose public transportation over driving their cars?

To meet these objectives, the Innovation Center partners with businesses and students who are interested in collaborating on projects that seek to improve VTA's efficiency, safety and customer experience.

The Innovation Center includes workstations where participants can develop, test, and showcase new technology. Pictured here are projects on display at the Innovation Center's opening.
Source: Santa Clara Valley Transportation Authority

CURRENT PROJECTS INCLUDE:

- Designing a trip planner that combines biking, walking, and transit to encourage multimodal transportation;
- Creating dynamic, or flex, transit service that will include on-demand features to improve first and last mile issues;
- Designing "smart stops" that have tablets built into the structure rather than paper schedules so that customers can plan their trips at the bus stop or train station (with real time information, wayfinding, and points of interest) and issue requests for buses to stop at that station; and
- Installing collision avoidance systems into buses to reduce the number of bus crashes with not only vehicles but also bicycle and pedestrians.

Each project is developed, tested and showcased at the Innovation Center to improve the customer experience and optimize the function of the county's future vehicles, freeways and other transportation infrastructure. Once projects successfully move through the Innovation Center, the end goal is to incorporate them into VTA's future transportation plans.

Source: Santa Clara Valley Transportation Authority

GREENVILLE COUNTY, SOUTH CAROLINA

REGIONAL PERSONAL RAPID TRANSIT

WVU Morgantown Personal Rapid Transit System

POPULATION: 482,000
SQUARE MILES: 785

Located about halfway between Atlanta and Charlotte on Interstate-85 in northwestern South Carolina, Greenville County is served by the Greenville-Pickens Area Transportation Study (GPATS)—the regional Metropolitan Planning Organization. This region stretches from Greenville-Spartanburg (GSP) International Airport, 15 miles east of the City of Greenville, to Clemson University, 30 miles to the west.[7]

The 2007 GPATS long-range plan envisioned two major multimodal transit corridors: one running north-south from Travelers Rest through Greenville to Fountain Inn; and the other running east-west, from GSP to Clemson.

More recently, motivated by the Envision America Smart City Challenge and the 2016 USDOT Smart City Challenge, this vision has been expanded to promote the incorporation of smart, connected, autonomous vehicles into area transportation planning, including the development of a personal rapid transit (PRT) system.

PRT systems are electric rail systems with small, ultralight podcars that operate on-demand 24/7, rather than on a set schedule. Riders can call a car to their station and, like an elevator, a vehicle arrives momentarily to deliver them to their destination along the line. Under this vision, PRT systems could be built at three "focal" locations – GSP Airport, Downtown Greenville, and Clemson City/University.[8] The region is currently pursuing

PRT SYSTEMS ARE ELECTRIC RAIL SYSTEMS WITH SMALL, ULTRALIGHT PODCARS THAT OPERATE ON-DEMAND 24/7, RATHER THAN ON A SET SCHEDULE.

these options to further explore the potential, through the following means:

- GSP, the second-busiest airport in the state with over 2 million passengers a year, has issued an RFP for the design and construction of a PRT system to transport passengers from a remote parking lot to the airport terminal. The airport chose to pursue the development of a PRT system as a less costly alternative to an at-grade shuttle and new parking deck.[9]
- The Greenville County Economic Development Corporation (GCEDC), a county-affiliated board, plans to pursue a public-private partnership to implement a system over 20 miles long that will run from downtown Greenville through to GSP, connecting major sites along urban corridors. It intends to phase in the project, first testing resident usage and reaction to the PRT system at three test case sites.[10]
- Clemson University and the City are exploring the feasibility of developing a PRT system. Their main goal is to reduce road congestion and parking problems close to campus.[11]

If these three systems come to fruition, they could ultimately be connected into a regional PRT system linking downtown Greenville with Clemson and the regional airport.

CONTRA COSTA COUNTY, CALIFORNIA

GOMENTUM STATION

Aerial view of Concord Naval Weapons Station.
Source: Contra Costa Transportation Authority

POPULATION: 1.1 MILLION
SQUARE MILES: 715

Contra Costa County, Calif., a suburban county of just over a million residents, is located in the Bay Area just east of San Francisco and north of Oakland. The Contra Costa Transportation Authority (CCTA) is the public agency in charge of managing the county's transportation planning and congestion management. CCTA works to connect the county's communities, foster a strong economy, increase sustainability and enhance mobility and accessibility in order to safely, reliably and efficiently get people where they need to go.

As part of these efforts, CCTA plans, funds and implements a variety of transportation projects and programs, including an initiative to research and test connected and autonomous vehicle technology, with the aim to address congestion by using innovative technology to improve existing infrastructure, rather than build more infrastructure. To achieve these goals, CCTA has created GoMentum Station, a connected vehicle/autonomous vehicle (CV/AV) test facility in Concord, Calif. The largest test facility of its kind, GoMentum Station is located on the site of the former Concord Naval Weapons Station, which consists of 5,000 acres of land and 20 miles of paved roadway.

In 2012, the U.S. Navy assigned the City of Concord a master license to plan for the area's adaptive reuse, and will gradually transfer the property to the City of Concord for eventual redevelopment.[12] Seeing an opportunity based on the site's specifications and location, CCTA toured the facility to gauge its potential uses, and the idea for a CV/AV test facility was born. In 2014, Concord granted CCTA a sublicense to open GoMentum Station on the base, allowing up to five automakers and 15 other companies access to the facilities.

The goal of GoMentum Station is to define the next generation of transportation. Through public-private partnerships, CCTA and its partners collaborate to research and test the validation and commercialization of CV/AV applications and technologies, creating space to test new transportation technologies on-the-ground, in real time, in a real-world setting.

To ensure that research is ongoing in a variety of different transportation technologies, CCTA engages a diverse set of partners, representing infrastructure owners/operators, including local jurisdictions and transit agencies; vehicle and equipment manufacturers and suppliers; technology companies and academia. Research topics are multi-modal and include infrastructure, connected vehicles, autonomous vehicles and other innovative applications. Partners sign a Memorandum of Understanding with CCTA which outlines their research plans, terms of payment and other stipulations (i.e. privacy needs). A few of the current partners include the City of Concord, ITS America, Stantec, Honda, EasyMile and Bishop Ranch. Partners may change year-to-year. While CCTA's ITS program is funded through a mixture of public and private funds, GoMentum station itself is entirely privately funded by its partnering organizations.[13] CCTA has plans, however, to diversify the project's funding.

The end goal of all this research and testing is to transition successful projects from the test facility to the county at-large. CCTA has already implemented a number CV pilot programs throughout Contra Costa, with plans to implement more, including transit tracking of commercial vehicles, radio-frequency identification of pedestrians to vehicles and bikes to transit, and integrated corridor management along local sections of interstate highways. Beyond the implementation of test facility successes, the objective of GoMentum Station is to advance Contra Costa County's goals of improved safety and mobility and increased job opportunities and regional economic competitiveness. CCTA aims to position Contra Costa County as a center for smart jobs, affordable housing and connected infrastructure.

CONNECTED AND AUTONOMOUS VEHICLE COUNTY POLICY

Counties across the United States are exploring the future of autonomous and connected vehicles. As part of these efforts, some counties have already taken initial steps to create policy that fosters the research and testing of CV/AV technology at the local level. For example, in July 2014, both Fayette County, Ga., and Johnson County, Iowa, passed resolutions encouraging autonomous vehicle testing.

FAYETTE COUNTY, GEORGIA

POPULATION: APPROXIMATELY 109,000.

Fayette County, situated about 15 miles south of Atlanta, is traversed by a number of state highways and is home to a vast network of multi-use paths used by pedestrians, bicyclists and golf cart drivers to travel between neighborhoods, retail centers, churches, schools and recreation areas. With Fayette County residents already used to low-speed vehicles, the County Board of Commissioners saw an opportunity for the county to be a testing lab for not only autonomous vehicle technology but also policy and regulation design. Through a new resolution, the county is now authorized as a pilot site for Autonomous Vehicle Design, Development and Testing, and is exploring partnerships with regional institutions, such as Georgia Institute of Technology, to become a live test bed for autonomous vehicles.

JOHNSON COUNTY, IOWA

POPULATION: APPROXIMATELY 142,000.

Johnson County, located in Eastern Iowa, is home to the National Advanced Driving Simulator (NADS) at the University of Iowa. NADS has eight research programs, of which ITS is one. The NADS ITS program has long been involved in the testing of advanced driver assistance systems, which are semi-autonomous safety systems such as collision warning, blind spot warning, lane keeping assist and adaptive cruise control. Johnson County saw an opportunity to capitalize on this work by passing a resolution allowing autonomous vehicles to drive on county streets. The aim is to encourage car manufacturers to conduct testing in the county, bringing in investment to bolster local economic development and position the county to benefit from technological developments and improve public safety.

GUIDE FOR COUNTY LEADERS

Initial Steps County Leaders Can Take:

- **EXAMINE LOCAL TRAFFIC PATTERNS AND SAFETY DATA.**
  What roads are used the most? What routes do commuters travel? Where are the local congestion and incident hot spots? How would connected infrastructure to those intersections help reduce the number of those crashes? These data can help to identify locations most suitable for imminent upgrades.
- **DRAFT LOCAL POLICIES.**
  What are your local policies around connected and autonomous vehicle technology? What are your local land use policies? How might the introduction of autonomous or connected vehicles affect the built environment and the future vision for the community? How should planned infrastructure upgrades be reconsidered or made more flexible to accommodate future technology innovations in transportation?
- **ASSEMBLE A TASK FORCE OR COALITION OF STAKEHOLDERS TO VOICE CONCERNS AND IDENTIFY MULTI-SECTOR APPROACHES.**
  Stakeholders could include not only county planners and engineers, but also citizens groups, safety advocates, law enforcement, industry representatives and legal counsel.
- **IDENTIFY INDUSTRY GROWTH POTENTIAL, INCLUDING WORKFORCE TRAINING OPPORTUNITIES.**
  The advent of this industry could create local opportunities not only for development and testing of the technology, but also to train engineers, planners, lawyers and other professionals on the planning, equipment, infrastructure and legal and financial implications of the industry.
- **KNOW THAT TECHNOLOGY CAN HELP TO SOLVE PROBLEMS, BUT ISN'T ALWAYS THE SOLUTION.**
  Many unknowns still exist around whether and how autonomous and connected vehicles can be efficient, safe, cost-effective components of a local transportation system. Before making major decisions dependent on the use of these new technologies, it is critical that county officials and county engineers assess the viability, practicality and suitability of these innovations in their communities.

Counties need to be able to respond quickly to changing transportation technology and the future transportation needs of their communities. While it is not clear how fast it will take us to get there, it is clear that connected vehicles and communities will become more prominent players in the future transportation landscape. Each county needs to take advantage of its own assets and consider its unique needs and opportunities. What is best for one county might not work for another. As CCTA Executive Director Randy Iwasaki said, "there is no manual for how you innovate."

> **"THERE IS NO MANUAL FOR HOW YOU INNOVATE."**
>
> *— Randy Iwasaki, Executive Director, CCTA*

As the use of advanced analytics, wireless and GPS technology, and related applications—including expanded use of connected and autonomous vehicles—grows in the transportation field, county officials, planners and engineers need to consider a number of potential challenges and opportunities. This guide is not meant to be an exhaustive list, but rather, to offer a starting point based on the experiences of the counties featured here.

CHALLENGES

- **SAFETY.**
  The transition from roads filled with only driver-controlled vehicles to roads filled with autonomous vehicles or a mix of driver-controlled and autonomous vehicles is not assured, and will not be immediate. How will autonomous vehicles react to vehicles with which they cannot communicate and which operate independent of the grid? What happens if passengers of driverless cars need to assume control of the vehicle but are unable to do so? What happens in cases of system failure? How can manufacturers ensure driverless cars stay in their road lanes even in inclement weather? Manufacturers and researchers are working on solutions to address the many unknowns and create safeguards for a myriad of potential scenarios, but many more questions abound. County leaders will need to investigate and consider the risks and safeguards available, and communicate with the public on these topics as the field evolves.
- **INFRASTRUCTURE COSTS.**
  Installing connected vehicle technology on or within infrastructure can be expensive. How will counties and other governments finance potential infrastructure upgrades? How will autonomous vehicles safely operate in sections of counties and other jurisdictions that do not include connected vehicle technology seamlessly throughout their domain? How will they operate in rural areas?
- **FLEET MANAGEMENT.**
  Counties may consider integrating various forms of connected and autonomous vehicle technology into county-owned fleets. What are the costs involved, and what are the risks?
- **CURRENT POLICIES AND REGULATIONS.**
  Many laws hinder not only the implementation but also the development of autonomous vehicles. It is important to know where your state and county rules and regulations stand. It must be noted, however, that technology is changing at such a rapid pace that any newly adopted laws allowing for the advancement of connected and autonomous vehicles must not only account for the technology developed this year but also must be flexible enough to encompass the eventual technology of the year to come.
- **REVENUE IMPLICATIONS.**
  Increased usage of driverless vehicles may have an impact on local revenue streams from local traffic management and policing, such as parking tickets, parking fees, or speeding tickets and other traffic violations. Relatedly, local costs for providing parking or managing congestion could increase or decrease in differing scenarios.
- **LEGAL LIABILITY.**
  Who will be held responsible in an accident, the driver/user or the manufacturer? How will law enforcement adapt to these new users? In the case of county-owned vehicles, what kinds of liability coverage need to be considered?
- **PRIVACY.**
  County governments need to be aware of risks inherent to sharing and manipulating information, including both individual privacy concerns and businesses' needs to protect sensitive information. When residents' movements can be tracked, how does the government protect their privacy?

As manufacturers address the technological problems and driverless cars make their way out of testing facilities and onto roads, governments will have to start having these conversations, if they have not already.

In-vehicle radio equipment installed on an emergency vehicle in Maricopa County, Arizona.
Source: Maricopa County

OPPORTUNITIES

- **SAFETY.**
  Safety is the major factor leading governments to invest in connected and autonomous vehicles and infrastructure. By eliminating the human element of the driver, manufacturers, researchers, and government agencies predict that traffic accidents, especially fatal ones, will decrease substantially, due to the reduction of human error.[14]
- **EXPANDED MOBILITY.**
  The use of autonomous and connected vehicles can expand opportunities for the non-driving population—such as disabled or elderly persons—to travel, thus expanding opportunities for employment, education and accessing services. Additionally, many transit agencies and jurisdictions are beginning to explore how the use of autonomous vehicles can assist with "last-mile" connections to transit services.
- **IMPROVED FUNCTIONALITY.**
  With vehicles connected to each other and to the grid, traffic congestion could be reduced. Vehicles should be able to travel with fewer stops at traffic signals thanks to optimized communication, and the use of traffic signals and vehicles equipped with DSRC signal preemption technology, such as emergency and transit vehicles.
- **NEW FUNDING AND PARTNERSHIP OPPORTUNITIES.**
  Investment in connected and autonomous vehicle testing can lead to new funding avenues for demonstration projects and partnerships with private investors or government agencies. Counties can explore partnerships with researchers, manufacturers and federal or state agencies to use county roadways as a testing lab or, depending on state legislation, raise public funds locally for infrastructure upgrades.
- **ECONOMIC DEVELOPMENT OPPORTUNITIES.**
  Counties with policies encouraging connected and autonomous vehicle development can create an atmosphere where smart tech hubs can thrive. By attracting new manufacturing and tech companies, counties can reap the economic benefits of new investment in the community.
- **INNOVATIVE FINANCING.**
  Local governments can explore innovative financing mechanisms, such as value capture techniques, to offset potential losses of revenues and balance funding streams needed to improve and maintain transportation systems incorporating connected and autonomous vehicle technology. By levying charges or fees on indirect beneficiaries of transportation systems as a means to recover costs, local governments can capture project expansion benefits, recover costs and create opportunities for revenue sharing with public and private-sector partners.[15]

County leaders can seize a number of opportunities to leverage new technology innovations to facilitate transportation services design and delivery, improve public safety and promote local and regional economic development. By making minute changes to infrastructure and policies today, counties can prepare themselves to be at the forefront of the mainstream application of connected and autonomous vehicle technology.

ENDNOTES

[1] Counties own 39 percent of bridges listed in the National Bridge Inventory. For more details and data sources, visit www.naco.org/counties-matter.

[2] "Maricopa County, Arizona," United States Census Bureau, http://www.census.gov/quickfacts/table/PST045215/04013; "About MCDOT," Maricopa County Department of Transportation, http://www.mcdot.maricopa.gov/about.htm.

[3] The county has partnered with the Arizona Department of Transportation (ADOT), the Federal Highway Administration (FHWA), and the University of Arizona to form the Arizona Connected Vehicle Consortium (ACVC). ACVC places an emphasis on improving transportation mobility, efficiency, economic productivity and safety.

[4] CV PFS is a program to support the development and deployment of connected vehicle applications. It was established by FHWA and 10 state and local transportation agencies who were early adopters of connected vehicle technology. Its mission is to prepare pilot deployment areas for vehicle-to-infrastructure applications. Each partner contributes money to the pooled fund, and then through an internal process it is decided which projects receive deployment funds. FHWA's Transportation Pooled Fund Program started in the 1990s to help reduce the marginal costs of transportation projects and more efficiently use taxpayer dollars.

[5] Traffic signal preemption occurs when certain vehicles, including emergency responders, obtain the right-of-way at an intersection before physically arriving at the intersection. This enables them to continue through without having to stop, which is important for emergency responders because every second counts when on the way to save a life.

[6] "Organizational Structure," Santa Clara Valley Transportation Authority, http://www.vta.org/about-us/inside-vta/divisions; "Financial," Santa Clara Valley Transportation Authority, http://www.vta.org/bart/financial.

[7] "About," Greenville-Pickens Area Transportation Study, http://www.gpats.org/about/.

[8] Interview with Greensville County, S.C., Council Member, Fred Payne. 20 Jan. 2016.

[9] "Notice to Potential Proposers: Proposed Automated Transit Network," Greenville-Spartanburg International Airport, http://www.gspairport.com/site/user/files/39/GSP-PRT-Project---Notice-to-Potential-Proposers-20160122.pdf.

[10] Interview with Greensville County, S.C., Council Member, Fred Payne. 20 Jan. 2016.

[11] "Personal Rapid Transit," Clemson University Institute of Advanced Vehicle-Infrastructure Technology, http://www.clemson.edu/centers-institutes/advanced-vehicle-infrastructure-technology/research/prt/; "Chapter VIII. Transportation Element," City of Clemson, http://www.cityofclemson.org/sites/default/files/planning/Chapter%208-%20Transportation_1.pdf.

[12] "Concord, Contra Costa Transportation Authority agree on ground rules for vehicle testing site," Marin Independent Journal, http://www.marinij.com/article/ZZ/20150708/NEWS/150706360.

[13] "Funding: Overview," Contra Costa Transportation Authority, http://ccta.net/funding.

[14] "Autonomous vehicles will have tremendous impacts on government revenue," Brookings, http://www.brookings.edu/blogs/techtank/posts/2015/07/07-autonomous-vehicle-revenue.

[15] "Using the Economic Value Created by Transportation to Fund Transportation," National Cooperative Highway Research Program, http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_459.pdf.

ADDITIONAL RESOURCES

U.S. DOT INTELLIGENT TRANSPORTATION SYSTEMS JOINT PROGRAM OFFICE:
http://www.its.dot.gov/research.htm

MARICOPA COUNTY, ARIZ.
http://www.maricopa.gov/
http://www.mcdot.maricopa.gov/ProjectSpotlight/smartdrive-program.htm
http://www.cts.virginia.edu/cvpfs_research/

SANTA CLARA COUNTY, CALIF.
https://www.sccgov.org/sites/scc/Pages/default.aspx
http://www.vta.org/projects-and-programs/programs/innovation-center

GREENVILLE COUNTY, S.C.
https://www.greenvillecounty.org/
https://www.greenvillecounty.org/County_Council/boards_commissions/economic_development_corp.asp
http://www.gpats.org/about/

CONTRA COSTA COUNTY, CALIF.
http://www.co.contra-costa.ca.us/
http://ccta.net/about
http://gomentumstation.net/vision/

JOHNSON COUNTY, IOWA
http://www.johnson-county.com/
http://johnsoncountyia.iqm2.com/Citizens/FileOpen.aspx?Type=12&ID=1189&Inline=True

FAYETTE COUNTY, GA.
http://www.fayettecountyga.gov/

ABOUT THE NATIONAL ASSOCIATION OF COUNTIES

The National Association of Counties (NACo) unites America's 3,069 county governments. Founded in 1935, NACo brings county officials together to advocate with a collective voice on national policy, exchange ideas and build new leadership skills, pursue transformational county solutions, enrich the public's understanding of county government and exercise exemplary leadership in public service. More information at: www.naco.org.

ABOUT NACo'S ECONOMIC DEVELOPMENT, TRANSPORTATION, & INFRASTRUCTURE PRACTICE AREA

To help counties grow stronger, more competitive, more resilient places, NACo supports county leaders seeking to develop innovative economic development strategies and invest in transportation and infrastructure systems to create great places.

Each year, counties invest billions in economic development and public infrastructure projects. Counties create economic development strategies; build and maintain roads, bridges, transit and water systems; develop land use plans and community development programs; support workforce training and business assistance; and convene decision-makers in public agencies, private firms and regional and state institutions.

Within this practice area, NACo convenes public- and private-sector stakeholders, produces special reports, develops webinars and podcasts, facilitates peer learning, provides technical assistance and hosts workshops and roundtable events.

This publication was developed with the support of the Federal Highway Administration (FHWA) under Contract No. DTFH6115C00028. Any opinions, findings and conclusions or recommendations expressed in this publication do not necessarily reflect the views of NACo or FWHA.

ACKNOWLEDGEMENTS

This report was researched and written by Jenna Moran, Program Manager, with guidance from Kathy Nothstine, Program Director.

Special thanks to the following individuals for providing their time and expertise:

- Hon. Steve Brown, County Commissioner, Fayette County, Ga.
- Randy Iwasaki, Executive Director, Contra Costa Transportation Authority, Calif.
- Gary Miskell, Chief Information Officer, Santa Clara County, Calif.
- Greg Parker, County Engineer, Johnson County, Iowa
- Hon. Fred Payne, Council Member, Greenville County, S.C.
- Traci Ruth, Communication Manager, Maricopa County, Ariz.
- Faisal Saleem, ITS Branch Manager, Maricopa County, Ariz.

To request copies of this publication or other materials about the National Association of Counties, please contact: Jenna Moran, NACo Program Manager, jmoran@naco.org, 202-942-4224.

Source: USDOT (cover image)

25 MASSACHUSETTS AVE NW SUITE 500 WASHINGTON, D.C. 20001 202.393.6226 WWW.NACo.ORG

facebook.com/NACoDC twitter.com/NACotweets youtube.com.nacovideo linkedin.com/in/nacodc