ITS AMERICA

ITS Technology Use Case Library

The Intelligent Transportation Society of America
1100 New Jersey Ave SE, Suite 850
Washington, D.C. 20003

2025

INTRODUCTION

The Intelligent Transportation Society of America (ITS America) is the nation's leading advocate for the technological modernization of our transportation system by focusing on advancing research and deployment of intelligent transportation technology. ITS America represents state and city departments of transportation, transit agencies, metropolitan planning organizations, automotive manufacturers, technology companies, engineering firms, automotive suppliers, insurance companies, and research and academic universities. Our members come to one table – ITS America – to shape the next generation of transportation and infrastructure driven by intelligent transportation technologies; one that is Safe, Smart, and Connected.

In January 2024, ITS America released the first edition of the library with 23 successful use cases, with the goal of highlighting successful projects with tangible outcomes across the country. We released Volume 2 in July 2024, and this was our first update to the library, which contained 10 additional deployments of ITS technologies from across the United States. We've updated our library again, with 8 new use cases released in June 2025 as part of Volume 3.

We have showcased a variety of technologies including vehicle-to-everything (V2X), artificial intelligence (AI), adaptive signals, smart work zones, automated vehicles (AVs), transit signal priority, rapid transit planning, smart data centralization, and more. From digital messaging improving traffic flow in California to digital alerts for EMS in Washington, DC and AVs bringing mobility to those with disabilities in rural Minnesota, we are proud of our members' accomplishments over the years and look forward to many more successful deployments in the years to come.

If you have any questions or would like to contribute your own use case to our library, please reach out or visit our website itsa.org.

Contact:
Jim Broderick
Policy Analyst
jbroderick@itsa.org

ITS AMERICA

TABLE OF CONTENTS

Automated Vehicles (AVs)

ITS AMERICA

ITS Technology Use Case Library:

V2X & Connected Transportation

Connected Vehicle Applications for School Buses

Alpharetta, Georgia

Improved safety and efficiency for school buses are two critical components of ensuring the well-being of students, both in terms of providing a safer journey for students and in ensuring access to education. By deploying connected vehicle technology in our school bus fleet, we can create a secure and efficient environment that promotes the overall well-being and academic success of school children across the country.

The Challenge

Each day in the United States, 26 million children are transported to and from schools on 480,000 school buses. While school buses are generally a safe mode of transportation for children once they are on the bus, the most dangerous time for students is boarding or deboarding the bus. [1]

One of the most significant dangers to onboarding or offloading students is drivers who illegally pass stopped buses and may be unable to stop in time to avoid hitting a student crossing the street from their bus to their home. Through the 2018-2019 school year, one study found that these illegal passings took place roughly 17 million times in the United States, and that **six students were killed by illegally passing drivers over a six-day period in October 2018 alone.** [2] Each of these deaths represents a tragedy that could be mitigated or prevented by transportation technology solutions, such as connected vehicle technologies.

26 million children transported by bus to and from school each day

About 17 million illegal bus passings in the U.S. in the 2018-2019 school year

Technology Solution

Connected vehicle technologies, such as cellular vehicle-to-everything (C-V2X) devices, provide critical alerts to both oncoming vehicles and bus drivers that communicate important safety information in real time. With C-V2X direct communications technology, the driver of an oncoming vehicle receives a direct message alert in the dashboard of their vehicle, providing an early notification that they are approaching a stopped school bus with its stop arm extended. The driver receives the alerts even when the school bus is not visible to the driver. Additionally, the school bus driver receives an alert of the approaching vehicle during a school bus stop as well as a warning if a vehicle is potentially approaching too quickly to be able to stop in time. This provides the school bus driver with critical information to make an informed decision on safety. The bus driver can then delay opening the door if the vehicle cannot stop or alert children outside the bus to remain on the curb and avoid the oncoming vehicle. In each of these scenarios, connected vehicle technologies provide a digital layer of safety to keep students safe getting to and from school.

Outcomes & Benefits

While safety improvements are a critical outcome of connected vehicle technologies, they also improve trip efficiency and lower emissions. In 2022, a consortium of public and private stakeholders led by Applied Information Inc. launched a School Bus Priority Connected Vehicle Student Safety Pilot Program in partnership with the city of Alpharetta, GA, and the Fulton County School System which was designed to test whether connected vehicle technologies would improve safety and mobility in school buses. The deployment leveraged C-V2X solutions provided by Qualcomm and Commsignia to test roadside units from Applied Information, which were mounted in flashing speed limit signs near school zones. The initial testing included an electric SUV and algorithms from Audi to test bus to personal vehicle connectivity. Connected vehicle technology was deployed on buses and at traffic signals along the school bus routes to provide green light pre-emption to the school bus as it approached each traffic signal.

The pilot program led to the following efficiency and sustainability benefits [3] :

13%
Decrease in travel times

18%
Increase in average speeds

40%
Decrease in # of signalized stops

10%
Decrease in fuel consumption

Beyond these environmental and operational improvements, bus drivers noted that students were better behaved on the bus due to fewer stops since students are not permitted to get up when the bus is in motion. Drivers also expressed a lower level of stress, and the district was able to manage more routes with limited resources.

Conclusion

By deploying connected vehicle technology in our school bus fleets, we can achieve multiple benefits that extend beyond the transportation system with one technology solution: improve student safety, enhance efficiency of travel times, improve fuel economy and reduce emissions, and create an environment that promotes the overall well-being and academic success of school children across the country. A study commissioned to analyze the results of the pilot noted that consistent and earlier school arrival times may lead to more students participating in free breakfast programs, for example. ITS America encourages school districts across the country to deploy connected vehicle technologies in our school bus fleets as well as associated infrastructure so that we can realize these safety and societal benefits.

Participants involved in this use case include Audi, Navistar, Applied Information, Blue Bird, Qualcomm, City of Alpharetta, GA, Fulton County School System.

Sources:

[1] New York School Bus Contractors Association.
[2] National Association of State Directors of Pupil Transportation Services
[3] Applied Information Inc.

Cooperative Adaptive Cruise Control for Freight

California

Streamlining freight operations and making traffic flow more efficient for trucks can have positive impacts on trucks' tailpipe emissions and operating costs. Through connected vehicle technologies like adaptive cruise control and freight platooning, fleet operators can reduce travel time on the road, limit fleets' impact on congestion, and save money on fuel costs. This creates a greener and safer transportation network for all road users regardless of vehicle type.

The Challenge

Medium- and heavy-duty trucks contribute 23% of transportation's greenhouse gas (GHG) emissions in the U.S., an amount that is expected to grow in the future. Trucking's CO2 emissions contribution from international trade is expected to grow to 56% by 2050, impacting efforts to combat climate change. Efficiency goes hand in hand with sustainability, and traffic congestion on U.S. highways added $94.6 billion in costs to the trucking industry in 2021. [1] Innovative solutions like platooning can ease and ultimately result in lower fuel costs and more on-time routes.

Beyond sustainability and efficiency, safety remains a key priority for the freight industry. Highway freight crashes contributed to 4,965 fatalities in 2020, a 21% increase from five years prior. [2] It is imperative that the highway freight industry take much needed steps to reduce this number. Effects of truck Cooperative Adaptive Cruise Control (CACC) on traffic operations were studied for an interstate highway in Southern California (I-710 northbound). This corridor connects the Port of Long Beach to the Interstate highway system and includes a large truck volume. The truck traffic percentage varies between 10% to 19%.

23% of U.S. transportation emissions come from trucks

Traffic congestion cost trucking industry **$94.6 billion** in 2021

There were **4,965 fatalities** from highway freight crashes in the U.S. in 2020

Technology Solution

CACC provides an intermediate step toward a longer-term vision of trucks operating in closely-coupled automated platoons on both long-haul and short-haul freight corridors. With CACC, only truck speed control will be automated, using vehicle-to-vehicle (V2V) communication to supplement forward sensors. The drivers will still be responsible for actively steering the vehicle, lane keeping, and monitoring roadway and traffic conditions. While truck platooning systems have relied on a Constant Distance Gap (CDG) control strategy, CACC has relied on a Constant-Time Gap (CTG) control strategy, where the distance between vehicles is proportional to the speed. The test route started from the UC Berkeley Richmond Field Station (RFS) in Richmond, via I-580 (to Emeryville), SR 24 (to Walnut Creek), I-680 (to Pleasanton), I-580 (to Livermore), and ended around Westley on I-5, about an 84-mile distance. After arriving at Westley, the drivers took a short break at a parking area near a truck stop and then returned to RFS via the same route, for a total traveling time of more than 3 hours.

Outcomes & Benefits

Trucks can reduce fuel consumption by **5% to 6%**

Avg. VMT in certain time span can increase by close to **6%**

Trucks could see over a **19%** increase in avg. speed

Adaptive cruise control leads to safer roads, both for truck drivers and other motorists. Predictive driving from trucks makes the road safer for other drivers and smaller gaps between trucks do not allow for smaller vehicles to weave in and out of the platoon. When the heavy trucks are driven using CACC at the tested time gaps between 0.6 seconds and 1.5 seconds, a three-truck platoon pulling conventional well loaded dry goods van trailers can save a total of between about 5% to 6% of its fuel consumption. Truck CACC increased Vehicle Miles Traveled (VMT) in certain time frames as well as average speed for both trucks and passenger cars. For trucks, average VMT increased by 5.8% and average speed increased from 33.3 MPH to 39.7 MPH, a 19.3% increase. The use of truck CACC can produce noticeable congestion reductions when used on a moderately congested urban freeway corridor with a substantial %age of heavy truck traffic. The relief of traffic bottlenecks saves significant time and fuel for the trucks, with modest congestion relief effects for the cars that share the freeway with the trucks

Conclusion

Cooperative adaptive cruise control for heavy-duty trucks has the potential to make freight travel more efficient, reduce congestion on highways, and expand the possibilities of freight shipping. As seen in this California case study, fuel and time savings can be realized by implementing CAAC within a fleet. While not fully reaching the concept of freight platooning, this connected technology and travel arrangement in California is well on its way to making freight travel smarter, more sustainable, and safer for other road users. ITS America fully supports the expanded use of CACC across the country so that we can builder a smarter, greener future in freight.

Participants involved in this use case include Caltrans, PATH Program at UC Berkeley, Volvo, FHWA.

Sources:
[1] Freight Waves
[2] NHTSA
[3] ITS JPO

Traffic Signal Integration for Rapid Transit

St. Petersburg, Florida

Building a successful rapid transit bus system not only requires community support and sufficient physical infrastructure, but also digital infrastructure tools to keep roadways operating smoothly and safely. With tools such as traffic signal priority and connected vehicle communications, bus systems are able to move passengers efficiently, safely, and between more destinations that once seemed out of reach for public transit. By deploying rapid transit with accompanying technology, cities and counties can reach new heights of mobility.

The Challenge

Anticipating and preparing for significant residential and commercial growth in the downtown St. Petersburg and South Pasadena areas, including supporting portions of the St. Petersburg Plan2050 long-term planning, the Pinellas Suncoast Transit Authority (PTSA) and the City of St. Petersburg identified the need for a new Bus Rapid Transit (BRT) service to enhance mobility between St. Pete Beach and downtown St. Petersburg along 1st Avenues North and South. The objective was to provide public transit service to support projected growth areas within 1⁄4-mile of stops along the routes with the potential to expand transit-supportive zoning practices up to and beyond a 1⁄2-mile where transit connectivity can be fostered and continuous. The corridor had no direct transit service linking communities and attractions in central St. Petersburg to South Pasadena or St. Pete Beach in the west. One of the other key objectives for the BRT is providing transit service for events at Tropicana Field, home of the Tampa Bay Rays Major League Baseball Team.

A new rapid transit route such as this required significant upgrades to road and intersection digital infrastructure, including traffic signal integration. The new ITS solution also had to seamlessly integrate with the existing dispatch system while controlling the traffic signals and providing traffic signal priority (TSP) to the SunRunner BRT buses. In addition, the new solution needed to provide center-to-center capabilities for BRT management coordination with two Traffic Operation Centers (Pinellas County and City of St. Petersburg).

Technology Solution

To accommodate and provide the new levels of traffic signal management required, the existing Advanced Transportation Management System (ATMS) software application was upgraded to a cloud-based ATMS that includes a Connected Vehicle (CV) route-based TSP capability to provide the BRT signal priority along the east and west corridors for the City of Saint Petersburg and Pinellas County. The upgraded ATMS includes Signal Performance Measures for 51 signalized intersections along the SunRunner BRT routes. With this technology implemented, buses SunRunner receives signal priority, working in tandem with the bus dispatch system and EMS dispatch to make intersections and bus service more efficient. In addition, the city made upgrades to the intersections, including 21 new traffic signal cabinets, and 50 CV-ready traffic signal controllers to support the new ITS communications and signal priority systems. This ITS technology upgrade has helped the new rapid transit system provide safe, efficient transportation in Pinellas County.

Outcomes & Benefits

Within the first year of operation, the SunRunner BRT has provided new levels of mobility for one million riders. It has also provided schedule reliability of bus stop arrivals at or below average travel times along the routes, particularly at high traffic volume times. The TSP call acceptance rate is better than 99.75%. This has enabled the SunRunner BRT bus service to maintain a service reliability frequency of 15 minutes on average.

As a result of the headway reliability performance, the SunRunner BRT also provides a 35% reduction in travel time compared to the Central Ave. bus trolley service along the parallel corridor in downtown St. Petersburg. In addition, the SunRunner BRT sees a 70% rider increase for the Tampa Bay Rays baseball game days over regular commuter day ridership with minimal change to service frequency or headway reliability, which is an indication that the BRT, combined with the ITS solutions, is providing a viable and sustainable mobility alternative for the entire community.

35%
Reduction in travel time compared to older trolley

15 MIN.
Average headway time for SunRunner service

1 MILLION
Number of riders in first year of operation

Conclusion

The SunRunner BRT features many of the latest ITS software solutions and systems integration, including TSP and SPM technologies. TSP allows SunRunner buses to communicate with traffic signals along the route to maximize green lights as the buses approach each signalized intersection while SPM enables the PSTA and the City of St. Petersburg to continually optimize traffic signal programming for transit schedule reliability. Moreover, the updated ATMS with TSP and SPM, as well as the technology infrastructure upgrades help future proof the SunRunner BRT service.

These connected vehicle and digital infrastructure tools allow SunRunner BRT to operate at maximum efficiency and safety, providing reliable transportation to residents and visitors of Pinellas County. ITS America supports the continued adoption of such technologies across the country. Our nation, through digital infrastructure investments, is on the cusp of a great opportunity in how we define our 21st-century transportation system, one that can provide greener communities, increased opportunity and equity, and safer streets for all Americans.

Participants involved in this use case include Econolite, Pinellas Suncoast Transit Authority (PSTA) City of St. Petersburg, FL, Highway Safety Devices, Inc.

Sources:
[1] Econolite

Preventing EMS Collisions with Digital Alerting

Washington, D.C.

Every day, emergency first responders work tirelessly to keep people safe in communities across the country. It is important that our roadways are not adding more challenges to an already demanding occupation. With statistics showing that first responders are facing more road issues than ever before, we must continue innovating to keep them safe. Digital alerting technology in vehicles can help reduce crashes and improve responder safety so they can continue to serve our communities well.

The Challenge

For decades, fire crews and first responders everywhere have relied on lights and sirens to get the attention of motorists, but statistics show that responders on the road are facing more danger than ever. Emergency Service Vehicle Incidents (ESVIs, including collisions and struck-by incidents, are the second leading cause of US firefighter fatalities, accounting for well over 450 deaths since 1994. Responder-to-Responder (R2R ESVIs, although less frequent, are another form of ESVIs that pose a significant risk to responders, especially given the speeds and sizes of the vehicles involved and the impact a single collision can have on a responding agency's staff and resources.

Did you know?

From 1996 to 2010, **over 22%** of first responder ESVI fatalities were caused by road-side struck-by incidents.

Washington, DC ranks as one of the most congested cities in the country, with a population of more than 685,000 living and working in a dense urban environment that is less than 70 square miles. A crew of 1,900 firefighters, EMTs, and paramedics serve at DC Fire and EMS Department which responds to all hazards in the city including traffic incidents and injuries, fire prevention and suppression, homeland security activities, and more. DC Fire and EMS serve the community through a fleet of over 400 vehicles and must navigate congested roads. Innovative digital infrastructure tools such as in-vehicle alerting can help DC's first responders reach destinations safely and quickly, guiding other vehicles to move over and mitigating the chance of a collision between responders.

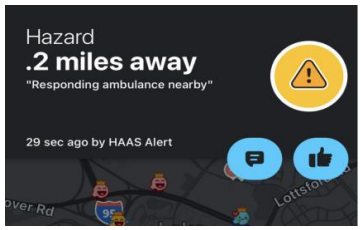
Technology Solution

HAAS Alert's collision prevention service Safety Cloud enhances emergency alerting on the road by alerting nearby motorists inside their vehicle that an emergency vehicle is nearby. To equip the service, fleets connect a small transponder named the HA-5™ to the emergency lightbar and mount the device to the vehicle dashboard. When activated, Safety Cloud delivers real-time digital alerts over cellular networks to nearby approaching civilian motorists. These alerts, called R2V (Responder-to-Vehicle) alerts, are received through navigation apps and connected car systems already in use by hundreds of millions of drivers, including WAZE. Safety Cloud offered DC Fire and EMS Department a novel solution for reducing the risk of civilian collisions that their fire crews had to face on every run. But the service also provided another option that was particularly useful to firefighters in DC: in addition to alerting civilians, Safety Cloud could also alert other responders. R2R alerts are received inside the emergency vehicle cabin through a small LED unit mounted to the A-Frame of the vehicle. When Safety Cloud detects a likely or imminent intersection between two equipped apparatus, the LED begins flashing, providing the vehicle operator with early warning of the potential hazard so that they can reduce speed and prevent a collision.

Outcomes & Benefits

Over the course of a year on Safety Cloud, DC Fire and EMS Department initiated nearly 444,000 emergency vehicle deployments in response to more than 212,000 911 calls. According to internal data, 20% of the DC fleet was equipped with the technology, leading to more than 630,000 digital alerts sent out during that year. **A detailed analysis of R2R alerting also confirmed that alerting responders of nearby emergency vehicles helped to reduce the risk of those collisions as well.** Data revealed that DC Fire and EMS Department apparatus operators reduced their speed by an average of 25% within the first second of receiving the alert. Such speed reductions are vital to avoiding crashes and keeping vehicles and pedestrians safe on the road.

The success of DC Fire and EMS Department year-long pilot of Safety Cloud R2V and R2R alerting led department leadership to keep Safety Cloud equipped on its vehicles. Today, the department's emergency vehicle specifications now include a requirement that all new emergency vehicles be equipped with Safety Cloud R2R and R2V alerting.



Photos courtesy of HAAS Alert.

20% of fleet equipped with Safety Cloud

630K alerts sent in one year on DC's fleet

25% speed reduction within first second of alert

Conclusion

Emergency personnel from the Washington DC Fire and EMS Department are now benefitting from an extra digital layer of protection through HAAS Alert's Safety Cloud. Digital alerting systems on both fleets and personal vehicles creates safer and more efficient roads, protecting drivers, pedestrians, roadside workers, and emergency personnel. After this initial deployment, HAAS Alert now delivers even more alerts to many personal vehicles and through the Waze app. ITS America supports the adoption of digital alerting infrastructure and connected technologies for EMS fleets across the country as we look to reach our Vision Zero and reduce fatalities and crashes. EMS workers are vital to the health and safety of not only our American roads, but our American communities. Without mechanisms in place to keep them safe, our communities would suffer.

Participants involved in this use case include HAAS Alert, Washington D.C. Fire and EMS Department.

Sources:
[1] HAAS Alert

Protecting Roadside Workers with Cloud-Based Alerts

Connecticut

Whether they are EMS first-responders or work zone operators, workers on our highways and roads work every day to keep drivers and pedestrians safe. However, they are not immune to crashes and safety challenges of our roads, prompting the need for innovative solutions from state and local officials. Digital alerting technology on dashboards can help reduce crashes and improve responder fleet safety so they can continue to serve our communities.

The Challenge

Working on the road is a dangerous job, and safety is the number one priority for state DOTs. Limited visibility and impaired or distracted drivers are just some of the risks that can increase the likelihood of collisions and struck-by incidents on the highway. Hundreds of thousands of crashes occur each year involving road workers including work zone operators, emergency responders, and roadside assistance fleets. Since 2017, struck-by deaths in the United States have been on the rise; in 2021, 65 road workers were struck and killed on the road, setting a new annual record. These crashes can be deadly and costly for communities.

65 Road Workers Involved in fatal crashes in 2021 in the U.S.

The Connecticut Department of Transportation is responsible for over 3,700 miles of road in the state including state routes, state roads, and the National Highway System. The department operates a fleet of 15 service trucks that patrol the roadway every day, keeping roadways clear and drivers safe. Additionally, when dealing with the safety of an entire fleet, costs are often the first concern. New hardware, maintenance requirements, and compatibility factors can quickly increase the overall cost of adopting a new technology.

10.8% increase in work zone fatalities between 2020-2021 [1]

Technology Solution

Determined to address this challenge, the Connecticut took action to protect their workers. Department planners landed on digital alerting systems to keep workers safe. Digital alerting reduces the risk of collision by giving motorists and vehicles advanced warning of alerting hazards on the road, such as roadside assistance and emergency vehicles. The alerts are delivered over cellular networks to popular navigation applications and vehicle dashboards. The Connecticut DOT had already deployed a Samsara integration into their road fleet, which posed an opportunity for HAAS Alert Safety Cloud. Safety Cloud offers an activation for Samsara users to activate Safety Cloud on their vehicles without any additional hardware.

Outcomes & Benefits

Connecticut DOT has been fully deployed on HAAS Alert Safety Cloud through Samsara since November 2021. The department is continuing to send out advance alerts to drivers and they are starting to see more cars moving over on the roads. By simply activating Safety Cloud through Samsara, Connecticut DOT accessed all the features of Safety Cloud in a quick, easy and cost-effective way. Digital alerts have been shown to lower the risk of a collision by up to 90% and reduce hard-braking near roadside incidents by 80%. Even without integration with Samsara and direct Safety Cloud through HAAS Alert, the Connecticut DOT could experience low-cost digital alerting for as a little as $1 per day. Safety has improved for the department with very little organizational input or effort. By simply activating Safety Cloud through Samsara, Connecticut DOT accessed all the features of Safety Cloud in a quick, easy and cost-effective way. Now their workers are benefiting from an added layer of protection.

Digital alerts lower the risk of collision by **90%**

Digital alerts reduce hard-braking by roadside incidents by **80%**

Conclusion

Roadside workers from the Connecticut DOT are now benefitting from an extra digital layer of protection through HAAS Alert's Safety Cloud. Digital alerting systems on both fleets and personal vehicles creates safer and more efficient roads, protecting drivers, pedestrians, roadside workers, and emergency personnel. After this initial deployment, HAAS Alert now delivers even more alerts to many personal vehicles and through the Waze app, ITS America encourages the adoption of digital alerting infrastructure on fleets across the country as we look to reach our Vision Zero and reduce fatalities and crashes. The partnership between the private and public sector in this example highlights the immense opportunity we have to create a digital ecosystem that improves safety while limiting financial burdens on the public sector.

Participants involved in this use case include HAAS Alert, Connecticut Department of Transportation.

Sources:
[1] Federal Highway Administration

In-Cab Safety Alerts for Commercial Trucks

North Carolina

As highway crash rates remain high, states are investing in safety solutions for some of the largest vehicles on the road – heavy duty trucks. Improving the safety of truck drivers can prevent potential crashes and reduce the rate of secondary crashes. Digital alerting and vehicle-to-everything (V2X) technologies, such as advanced in-cab alert systems, can warn commercial motor vehicle (CMV) drivers of potential traffic slowdowns or work zones, allowing them to adjust their speed accordingly.

The Challenge

The North Carolina Department of Transportation (NCDOT) operates and maintains over 80,000 miles of roadway, approximately 2,500 miles of which make up highways. [1] **In 2021 alone, there were 15,557 CMV crashes in North Carolina.** Timely, accurate information is especially critical for truck drivers as it takes longer for these heavy vehicles to slow down or come to a complete stop. When a traffic incident occurs, such as a crash or work zone related slow down or stop, real-time traffic alerts are crucial for providing updates. Traditionally, NCDOT relied on speed maps, traffic cameras, and law enforcement to provide the traffic management center (TMC) with alerts for drivers through Dynamic Message Signs (DMS), a traveler information website, and a 5-1-1 phone system. Some challenges exist, as it takes time to get information to drivers and drivers have to actively seek out traffic incident information through the website or by phone when DMS is unavailable. Since there are only 300 DMS in North Carolina, availability is also limited in some locations. In addition to the lack of DMS, there have been instances of inaccurate and generic messages being displayed, which confuses motorists and has negative impacts on traffic flow.

Technology Solution

CDOT has worked to address these concerns by partnering with INRIX, a probe speed data provider, and Drivewyze, which provides in-cab communications to CMV's via Electronic Logging Devices (ELDs). The INRIX/Drivewyze system works by first having NCDOT define the corridors on their roadway system. Then, Drivewyze receives notifications from INRIX and displays alerts onto ELDs in trucks. The in-cab slowdown and congestion alerts allow trucks to have more time to react to stopped traffic or major slowdowns. [2] These notifications have also allowed for the NCDOT to have more timely, reliable data as to where and when incidents occur.

This technology is a faster and more direct way to get information to truck drivers without the intervention of the TMC or having drivers seek out information themselves. Having ample time to adjust to unexpected traffic or hazards is critical to preventing further CMV crashes.

Outcomes & Benefits

Using INRIX data, 150,000 dynamic traffic alerts of a sudden slow down and congestion have been issued since NCDOT adopted the alerting system in 2021. An additional 384,000 work zone alerts were issued during a bridge replacement in western North Carolina and another 24,000 restricted route alerts have been issued as well. [3] A separate case study of a work zone along I-95 in North Carolina found that alerts positively impacted truck driver behavior, with 70% of alerted users slowing down their speed. [3] According to the result, speeds dropped by an average of 8 to 11 MPH based on the type of alert the driver received.

The INRIX/Drivewyze notification system can reduce secondary crashes by providing advanced notification of slowdowns and congestion, allowing drivers to adjust their behavior. Highway safety in North Carolina has improved since the deployment of the alerting system, as real-time notifications are now more accessible to truck drivers and these alerts help prevent further crashes from occurring..

Conclusion

As technology continues to advance, agencies can use digital alerting systems to make their highways safer. These connected transportation systems directly alert CMVs of critical safety information, which allows state and local agencies to be proactive in managing their highways. As seen in North Carolina, allowing truck drivers to have time to react and adjust to congestion and work zones decreases the overall speed in these areas, which in turn makes highways safer. ITS America supports the development and deployment of connected notification systems in commercial motor vehicles to improve safety on highways.

Participants involved in this use case include INRIX, Drivewyze, and North Carolina Department of Transportation.

Sources:
[1] NCDOT
[2] Drivewyze
[3] NOCOE

Improving Digital Alerts for Connected Vehicles

Wyoming

With weather adversely affecting road conditions, connected vehicle technologies and supporting digital infrastructure is needed to create a safer environment for drivers of all types of vehicles, large and small. By creating an efficient connected vehicle (CV) environment, state and local agencies can deliver potentially thousands of alerts to drivers every month, giving people critical information to make safe driving decisions.

The Challenge

I-80 is the major corridor for east-west freight transport through the U.S. and runs 402 miles along southern Wyoming. This section of I-80 is known for severe weather conditions, including ice, snowpack, and reduced visibility from blowing snow and gust wind, along with steep grades up to 7%. These conditions, coupled with the high percentage of truck traffic (around 47%), are the reason for many primary and secondary crashes with fatalities and serious injuries, as well as frequent road closures that cause safety and economic challenges for the state and drivers. Research showed that about 54% of truck crashes are due to ice conditions, while about 46% are associated with snow conditions. Most of the fatal crashes occurred in car-truck collisions. [1, 2] Additionally, about a third of drivers involved in crashes are licensed out of Wyoming, which shows unfamiliarity with the Wyoming winter driving conditions. [3] Alerts and advisory messages through applications such as situational awareness, weather impact warnings, and forward collision warnings could prevent a significant number of crashes caused by weather conditions. [4]

47% truck traffic on I-80

Icy roads cause **54%** of truck crashes

Steep grades up to **7%**

Technology Solution

To improve safety and efficiency and reduce the economic costs of road closures, during the Wyoming Connected Vehicle Pilot Project (WYCVP), defined goals were to reduce primary crashes and their severity, improve emergency response and prevent secondary crashes, and improve truck parking information and work zone information. To achieve these goals, the WYCVP needed dynamic Travel Information Messages to be broadcasted in-vehicle and warn drivers of road and weather conditions, road closures, and crashes. The first step was the installation of Roadside Units (RSUs) and Onboard units (OBUs) on state vehicles and partners' trucks. However, the price tag associated with RSU covering all 402 miles through rural areas without preexisting infrastructure increased state expenditures. Using the Public-Private Partnership, the WYDOT extended coverage through the Situation Data Exchange (SDX) and 3rd parties. [5] The SDX is a centralized data retention and distribution source for secured CV messages, including TIMs, Work Zone Data Exchange feed, and other types of messages as needed. Data from the SDX is further available to satellite radio, GPS navigation applications, or directly to OEMs to integrate into their infotainment center. The SDX also enables hands-free requests for traveler information from drivers who use Alexa skills on their smart devices.

Outcomes & Benefits

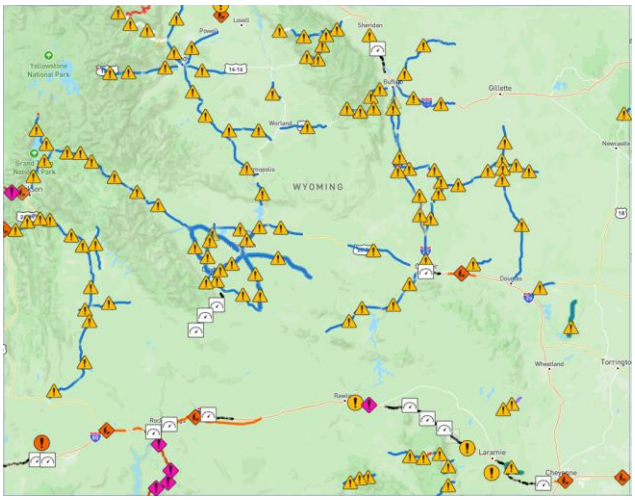


Photo courtesy of Trihydro Corporation.

At the end of the 3rd phase of the project, WYDOT published the final system performance measurement and evaluation of the WYCVP. [6] The report summarizes the results of real-world demonstrations from January 2021 to April 2022 of applications developed to improve safety and mobility, including TIMs. Even though the study did not make a distinction between messages delivered over RSUs and through SDX, results showed promising safety benefits. **The report highlights increased speed limit compliance, especially during severe weather conditions, and a reduction in average crashes per year by up to 42% for all vehicles and up to 28% for truck traffic.** Moreover, in the transition period from the DSRC technology to the C-V2X, SDX has been actively providing TIMs with constant expansion of the capabilities.

On average, **40,000 messages** were delivered to drivers each month

42% reduction in average crashes per year for all vehicles

Conclusion

Emerging technologies such as CVs have a huge potential to improve traffic safety. However, deployments have many challenges, including data sharing and digital alerting systems on roadways that must adapt to connected vehicles. Solutions such as SDX are examples of how we need to consider all options to solve traffic safety and operation problems. ITS America supports the continued adoption of CV technologies in states, along with a strong digital infrastructure to support deployments. Without efficient data sharing and communication, CVs may not have their desired impact on driver and pedestrian safety.

Participants involved in this use case include Trihydro Corporation, Wyoming Department of Transportation, SiriusXM.

Sources:
[1] ITS JPO
[2] WYDOT
[3] WYDOT
[4] ITS JPO
[5] Trihydro
[6] ITS JPO

Using Data to Implement Safety Countermeasures

New York City, New York

Collecting accurate, timely transportation data is critical in densely, populated areas in order to maintain safe roads and minimize traffic congestion. With a variety of modes of transportation, from pedestrians to cyclists to transit systems, transportation agencies rely on data from the movements of multimodal road users to provide insight into potential problem areas. Accurate data from vehicles is also crucial, especially when agencies are trying to limit vehicle speeding and dangerous driving.

The Challenge

The New York City Department of Transportation (NYC DOT) manages one of the most complex urban transportation systems in the world and is responsible for providing a safe and efficient transportation system for millions of residents and commuters. Collecting high-quality, real-time traffic data is critical to adjusting traffic management systems to mitigate congestion and safety challenges. A majority of existing traffic data analytics rely on manual counting and radar speed monitoring which can be resource intensive and lead to difficulty quickly responding to problem areas. Current analytical systems also may often provide outdated, incomplete data and cannot adjust to real-time traffic flow and issues areas. In order to successfully introduce safety countermeasures, agencies like NYC DOT need to distinguish between slow moving vehicles, pedestrians, and bicyclists – a difficult task when only using mobile device data, for example.

NYC DOT oversees **6,300 miles** of streets and highways

29% of road fatalities in 2022 in urban areas were due to speeding

In New York State, **about 30%** of all traffic fatalities have speeding as a contributing factor

Congestion is a significant problem in populated urban areas such as New York City. Studies find that the average urban commuter spends 54 hours in traffic per year [1], and increased congestion has been shown to lead to higher rates of injury and death on the road. [2] New York City also faces challenges with speeding, which contributes to road fatalities and exacerbates the need for stronger road safety measures. In 2022, 29% of motor vehicle crash deaths in urban areas were a result of speeding. [3] With as populated of an area as New York City, vehicles that are speeding could quickly lead to deadly outcomes for vulnerable road users (VRUs).

Technology Solution

NYC DOT's Office of Research, Implementation, & Safety (RIS) partnered with Geotab ITS to address congestion and speeding concerns. The Roads product from Geotab's Altitude platform allowed the Department to gain insights and access to telematic data that gave an accurate picture of the speed and travel time of vehicles on individual road segments and combined streets. Through this adapted technology, RIS could better identify problems and monitor the effectiveness of implemented solutions. Roads could even filter data by vehicle type to measure speed, which provides more accurate congestion and speed data.

Based on Geotab's technology and data collection, RIS can determine whether speeding issues need to be investigated further. The Department can also pull relevant data using filters such as time of day, vehicle class, and time spans, which makes it easier to implement interventions. Sorting through data can often be time intensive, while Geotab's platform allows for easy access through straightforward filters.

Outcomes & Benefits

Connected vehicle technology and telematics enable agencies to have reliable, real-time data to address congestion and speeding concerns. These technologies save time, money, and resources that can be redirected to other safety priorities. Using this data, NYC DOT can determine speeding and congestion hotspots as well as potentially unsafe infrastructure design and can make data-driven decisions when enacting safety countermeasures such as reduced speed limits, traffic calming designs, and signal timing.

The collaboration between NYC DOT and Geotab ITS has produced positive results in the areas that use Roads. By implementing connected vehicle technology, Geotab ITS has saved NYC DOT money and resources previously spent on traffic interventions that were based on incomplete data. Instead of manual radar speed monitoring, Roads allows departments to precisely monitor safety and speed issues and quickly administer interventions from off-site locations. The School Safety group, for example, has discovered multiple problem corridors through the Roads program that are receiving priority attention to make them safer for VRUs.

Conclusion

Connected vehicles and advanced data collection have the potential to improve traffic congestion and safety by providing reliable, accurate data. New York City is now benefiting from time- and cost-saving connected vehicle and telematic data as a result of implementing Geotab's Roads system. Data-driven safety countermeasures are critical to keeping roads safe for drivers and vulnerable road users as the U.S. looks to reach Vision Zero goals.

Participants involved in this use case include Geotab ITS and New York City Department of Transportation.

Sources:

[1] Geotab ITS

[2] Current Understanding of the Effects of Congestion on Traffic Accidents

[3] IIHS- Urban/Rural Comparison

[4] New York State Governor's Traffic Safety Committee

Moving Efficiently with Transit Signal Priority

Redding, California

The Challenge

The City of Redding, California may not be the largest in the state, but maintaining an efficient and reliable public transit program can be challenging for any small or mid-sized town with competing priorities and limited resources. With an estimated population of just under 95,000 in 2023, Redding had fluctuating population growth and increased traffic congestion which can hamper quality of life in communities.

Maintaining and operating public bus services in a small to mid-sized city is critical to ensuring the community's most basic needs are met – such as grocery store trips, and medical appointments.

Technology Solution

Miovision's Opticom integrates multiple data sources to provide real-time data that is accurate and fast for TSP applications. This allows the Opticom TSP system to operate effectively with accurate information on which vehicles were actively in service and requiring priority.

The Redding Area Bus Authority (RABA) wanted to improve bus service and reduce travel times within their network. Using Miovision's Opticom Transit Signal Priority (TSP), RABA is able to monitor their transit system in real-time and deliver reliable service to their community. Analytics about their buses' journeys help RABA see what intersections or routes may need TSP the most, bottlenecks, and how to better plan transit schedules.

Outcomes & Benefits

With TSP, average travel time per trip was reduced by 15%, dropping from 36.5 minutes to 31 minutes during peak hours. There were 18 transit vehicles and 15 intersections equipped with the technology.

As a result of the changes, there has been increased ridership and consumer satisfaction from the bus service. Miovision's cloud-based TSP services reduce the need for costly hardware, saving agencies like RABA critical financial resources.

Average Travel Time Reduced by 15%

Conclusion

While just one of many tools to help improve transit operations, transit signal priority is a smart, cost-effective solution for agencies looking to improve reliability and efficiency. A more connected transportation system, such as this one in California, helps move people and goods more seamlessly and safely. Transportation technologies like signal priority as a cost-effective way to improve transit ridership, service reliability, and travel times.

Participants in this use case include Miovision and the City of Redding, California.

Sources:

[1] Miovision

Piloting C-V2X in Urban Canyons

New York City, New York

Challenge

New York City was one of three Connected Vehicle (CV) pilot deployment sites selected by the U.S. Department of Transportation to demonstrate the benefits C-V2X technology. Road safety remains a challenge across New York City, particularly for vulnerable road users such as pedestrians and cyclists who navigate busy, congested city streets. NYCDOT undertook this project using Federal Highway Administration funding to address the safety challenges on its roads and attempt to address the efficiency of their roadways among the city's boroughs.

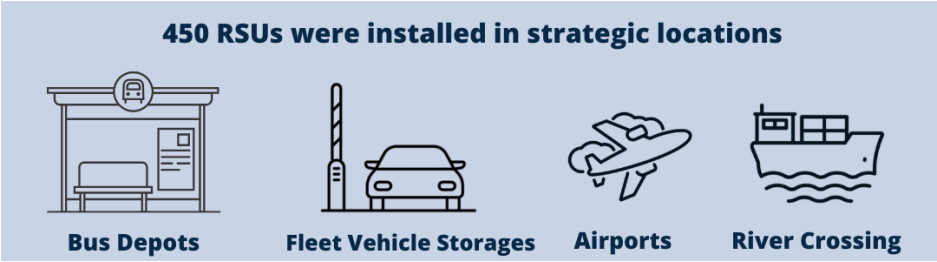
As part of the pilot project, NYCDOT encountered challenges related to government procurement processes, quantity of roadside units (RSUs) needed, and fleet management.

A major challenge that NYCDOT had to overcome during the course of this project was the urban canyon environment that affected the ability of the system to accurately locate and communicate with the vehicles in the streets.

Fleet management and outfitting vehicles with Onboard Units (OBUs) requires large amounts of coordination and effort across different agencies within the New York City government. This proved challenging for the city and is something to consider when deploying V2X on fleets going forward.

Technology Solution

The CV technology is a tool to help NYC reach its Vision Zero goals to eliminate traffic related deaths and reduce crash related injuries and damage to both the vehicles and infrastructure. The New York City deployment is primarily focused on safety applications – which rely on vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I) and infrastructure-to-pedestrian (I2P) 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. Throughout the project, the urban canyon challenge was resolved by using a higher number of RSUs in order to cover as many open areas as possible.



As part of this project, New York City installed CV technology in approximately 3,000 city vehicles which frequent the streets of Manhattan. These fleet vehicles represent about one million miles of vehicle travel per day. Approximately 450 RSUs were installed in Manhattan, along Flatbush Avenue in Brooklyn, and at other strategic locations such as bus depots, fleet vehicle storage facilities, river crossings, and airports.

Outcomes & Benefits

The Department was able to use Secured Credential Management Systems (SCMS) successfully, GPS augmentation using triangulation in urban canyon environment, and various system engineering plans to move forward with the project successfully.

The project successfully demonstrated the capabilities of C-V2X for 13 safety applications and was a significant learning experience within one of the most complex city transportation environments in the world.

This connected vehicle pilot in New York City highlights the opportunity for using C-V2X to improve roadway safety and efficiency, while also helping state and federal agencies learn for future deployments of technology.

Conclusion

V2X can help improve safety and mobility on the road, and pilot deployments like this one in New York City illustrate the potential for future scaled projects and the benefits of using V2X communications among fleets as a starting point. Connectivity writ large can help provide drivers and vulnerable road users with an additional digital layer of information that helps them make informed decisions on the road and can keep people safe on busy streets. As projects continue to scale, others can look to the New York City pilot as an example of how to fund, procure, and deploy V2X solutions in their respective city.

Participants in this use case include New York City Department of Transportation.

Sources:
[1] New York City DOT

Deploying Connectivity with Unique Business Models

Oakland County, Michigan

Challenge

Road safety and high traffic volumes remain a challenge across the United States, including in Michigan. In 2023 alone, there were over 287,000 crashes in the state, including over 1,000 fatalities [1]. Cities and counties across the state are working to decrease the number of crashes and injuries on their roads by deploying innovative solutions that help to proactively reduce the chance of a crash or incident.

In addition to safety concerns, the increasing population in Oakland County, Michigan can lead to increased traffic and congestion on busy roads, particularly during rush hour. According to a recent report this year, Oakland County grew 1.2%, its fastest annual growth rate since 1995 [2].

Increased population and congestion necessitate the need for innovative solutions that can increase vehicle throughput without the need for road expansion.

As part of an ongoing commitment to road safety and improving transportation in its community, the Road Commission for Oakland County (RCOC) partnered with P3Mobility and other organizations to deploy V2X technology. As V2X technology matured, RCOC sought to maintain its leadership by identifying a practical deployment model that could address safety and efficiency issues at signalized intersections. At the same time, RCOC wanted to explore a sustainable business model that could support long-term maintenance and scalability without relying solely on public funding.

Technology Solution

As part of a SMART Grant project, the RCOC and P3Mobility teams successfully implemented C-V2X signal priority. This also included the introduction of P3Mobility's Authorization Server, a cloud-based platform that authenticates and grants access to connected vehicle services based on user credentials.

This solution allows agencies to configure subscription-based access for Freight Signal Priority (FSP) and other V2X applications, enabling certain fleet operators to pay for and receive signal priority services as a value-added feature. This approach demonstrates the technological potential for a sustainable financial model, allowing IOOs to generate revenue from high value use cases.

In addition, the project leveraged dual-mode V2X (RSUs) to address the limitations caused by the previous reallocation of the 5.9 GHz ITS band. These RSUs were configured to broadcast SDSM messages using the DSRC protocol over the U-NII bands. This configuration enables the broadcast of large, bandwidth-intensive messages such as those used for cooperative perception, which would otherwise exceed the available capacity in the reduced 5.9 GHz spectrum. At each intersection, the accuracy of VRU alerts was evaluated by comparing system-detected VRUs with actual positions and using qualitative driver feedback.

The project also demonstrated V2X Fleet Intelligence. This system aggregates SAE J2735 messages—such as BSM, SPaT, MAP, and SDSM—to visualize a full driving scenario for equipped vehicles. By correlating vehicle behavior with signal timing, infrastructure status, and sensor data messages, the system provides a comprehensive picture of how drivers respond to their environment. This enhanced situational awareness can support insurance applications by offering detailed, verifiable data in the event of incidents or near-misses, helping assess fault, validate claims, and even refine risk models.

Outcomes & Benefits

The project was successful for the RCOC and all the partners, including the successful deployment of interoperable Direct V2X using SCMS-secured SPAT, MAP, and SDSM messages.

The project also demonstrated a subscription-based financial model supported by a V2X Authorization Server to manage user access to V2X services such as freight signal priority.

As part of the ongoing work to improve road safety and efficiency, signal priority applications were successfully tested, with early results showing travel time improvements for vehicles on the road.

RCOC, P3Mobility, and their partners also developed Community Engagement and Workforce Development Plans to build public understanding and long-term system support for V2X technology, an impactful exercise that will help promote the acceptance of advanced transportation technology over time.

Conclusion

Not only did this SMART Grant project demonstrate the technical abilities of V2X messages, signal priority, and fleet intelligence, but it also highlighted the different types of funding and contracting models that may exist for V2X projects, or transportation technology deployments more broadly. P3Mobility's work with the Road Commission of Oakland County helped show the incredible potential of V2X technology if deployed at scale in vehicles and infrastructure, while successfully demonstrating sustainable business models and public-private partnerships.

Participants in this use case include P3Mobility and the Road Commission for Oakland County, Michigan.

Sources:

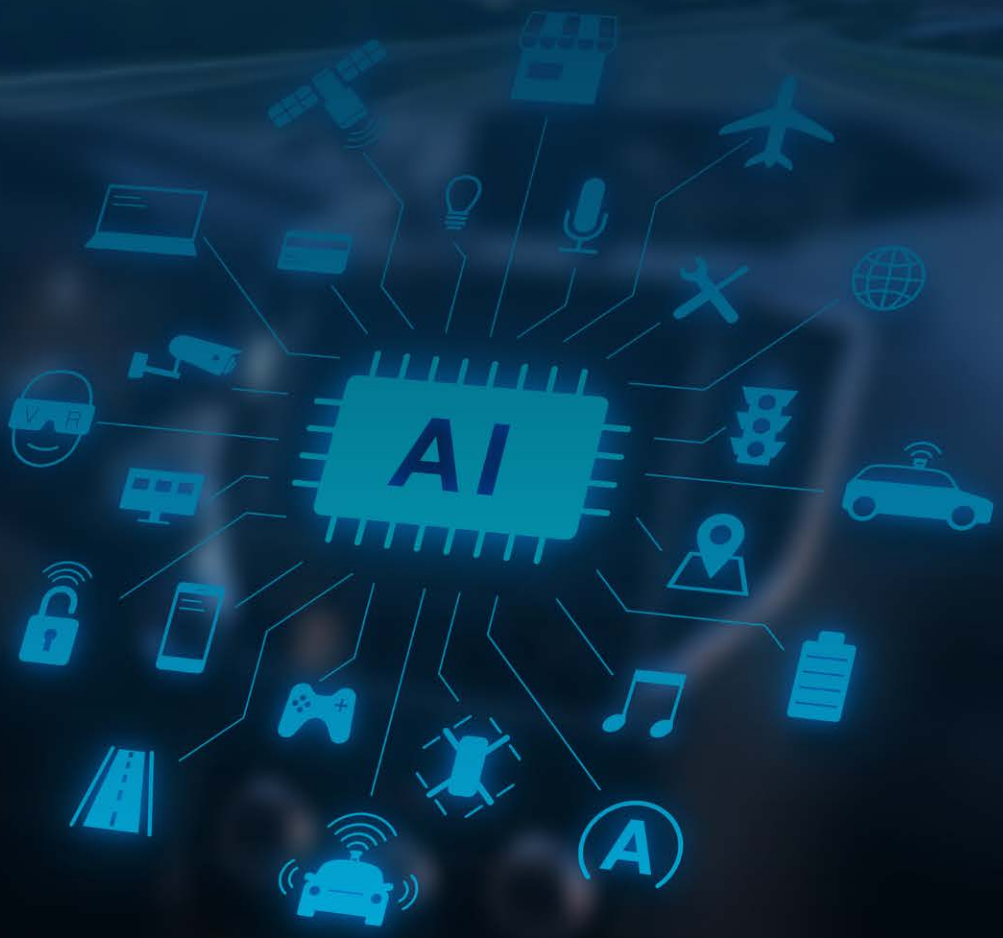
[1] Michigan State Police

[2] Yahoo News and U.S. Census Bureau

ITS AMERICA

ITS Technology Use Case Library:

Artificial Intelligence



Artificial Intelligence Crash Response Management

Southern Nevada

Decreasing the number of traffic crashes and improving police officer response times to emergencies are critical to the health and well-being of communities across the U.S. Using cloud-based software and artificial intelligence (AI), public safety agencies can share traffic data and real-time emergency updates, helping police and emergency services reach destinations faster. Monitoring traffic patterns, real-time crashes, and road closures not only speeds up response times, but it prevents more crashes from occurring.

The Challenge

When a crash occurs, officers may receive incident alerts solely from 911 calls routed through a traditional computer system, but these could include cases of misreported locations, lack of crime reports, and incorrect information. Traffic crashes can happen on highways with little to no location markings, making it difficult for emergency personnel to reach the location on time. Accurate information can help dispatchers send the right number of officers to the right locations in a timely manner.

As public safety officers respond to 911 calls, they must contend with the same traffic slowdowns, construction zones, and road closures that everyone in the community faces. With police officer response times increasing across multiple cities, every second counts in keeping people safe. [1]

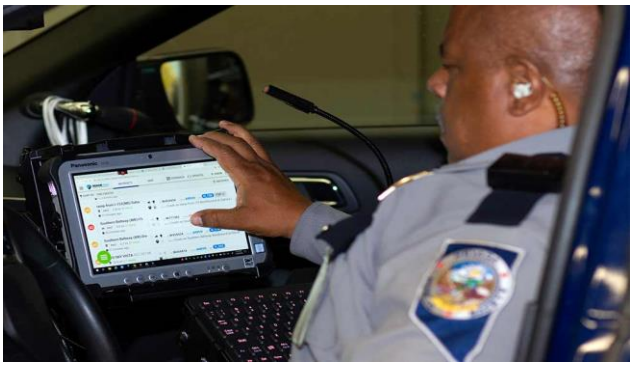


Photo courtesy of Rekor.

The Nevada Highway Patrol (NHP), a division of the Nevada Department of Public Safety, is responsible for law enforcement across the entire state of Nevada. Its Southern Command in Las Vegas shares a dispatch center with the Regional Transportation Commission of Southern Nevada's (RTC) and Freeway and Arterial System of Transportation (FAST), the division responsible for monitoring and controlling traffic in the Southern Nevada region.

NHP, RTC, and FAST shared a dispatch center, but each agency used different software systems, making communication cumbersome. Without a common system, the agencies were unable to effectively share real-time information hindering their ability to be prepared and respond to incidents quickly.

Technology Solution

Nevada Highway Patrol selected Rekor Command™ because it is fully cloud-based and accessible to NHP users through their mobile digital computers, tablets, and desktops. The platform allows NHP, Nevada Freeway Service Patrol (FSP) Units, and Roadway Maintenance to communicate together seamlessly, with every agency accessing the same information at the same time, improving response times and coordinating efforts. Rekor's live map technology shows active crashes, traffic slowdowns, construction zones, road closures, and more. Additional map layers showed the location of other NHP Officers, Nevada FSP Units, and other public safety officers. The software also incorporated CCTV footage, giving officers another viewpoint when responding to incidents. Officers receive alerts through icon notifications, and when they click on the incident alert, all relevant details appear, including the precise incident location, a 20-second looped GIF, geofenced CCTV footage, insights on current road conditions, as well as relevant notes.

Outcomes & Benefits

Rekor's technology has reduced crashes on roads, improved response times, and even helped agencies lower spending related to emergency responses and crashes. [2,3]

18% crash reduction rate

43% of crashes detected faster than 911

9–12 min. decrease in emergency response time

43% reduction in spending

Photo courtesy of Rekor.

Conclusion

With the use of emerging AI technology in traffic management and emergency responses, crashes can be prevented, and countless lives can be saved. Beyond improving traffic flow and congestion problems, public agencies can use AI to lower police and EMS response times and strengthen information gathering necessary to keep motorists and pedestrians safe. This program in Nevada is a prime example of how innovative private and public partnerships can lower spending costs for government agencies, improve road safety, and increase public trust in police and EMS departments. When every minute saves lives, this shows the importance of technology solutions as a part of the safe systems approach to post-crash care and safer roads for all.

Participants involved in this use case include Rekor, Nevada Highway Patrol, Regional Transportation Commission of Southern Nevada.

Sources:

[1] NPR

[2] ITS America Digital Infrastructure Forum, June 2022

[3] Rekor

Optimizing Bus Services with AI

New York City, New York

Dedicated bus lanes are important for maintaining safe and efficient routes for buses. It is crucial that bus lanes be clear of obstacles and other vehicles in order for riders to arrive at their destinations on time. Artificial intelligence (AI) applications can detect vehicles parked illegally in bus lanes, alerting bus drivers and transit authorities of obstructed bus lanes to improve the efficiency of operations. When public transit moves on time, people get to their destinations quickly and easily, bringing economic benefits to a community.

The Challenge

In dense, populated metropolitan areas such as New York City, parking is often limited. As a result, cars illegally park or stop in bus lanes, blocking city buses from reaching their destinations in a timely manner. These violations have contributed to New York City buses having an average speed of 12 MPH, delaying the arrival time to bus stops. [1] In addition to delaying buses, illegal parking in bus lanes can hurt transit ridership because it limits accessibility to the city, and uncertain schedules may make users look to other modes of transportation. **In New York City, there are over 150 miles of bus lanes, making it difficult to monitor every violation that occurs.** [2] Improving bus speeds and reducing the time spent per commute trip is a crucial priority for New York City's Metropolitan Transportation Authority (NYC MTA).

When public transportation faces challenges, so do its riders. Research has shown that minorities make up a disproportionately large share of public transit riders, so when buses do not run smoothly, these communities are often hurt the most. Delays in route schedules limits people's ability to reach jobs, healthcare, or other critical services. Illegal parking at bus stops also makes it difficult for buses to pull up to the curb properly, which makes boarding unsafe and inaccessible for those in wheelchairs or who have mobility issues.

Technology Solution

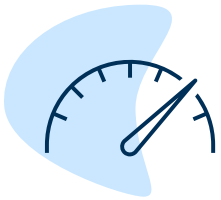
NYC MTA partnered with Hayden AI to equip city buses with an AI-based solution to help navigate illegally parked cars in bus lanes. Hayden AI combines computer vision with on-board cameras and embedded connectivity, such as 5G, to help municipalities create smarter fleets by accurately locating detected vehicles along bus routes. These tools have the capability of protecting bus and bike lanes, helping keep school zones safe, and enhancing the safety of other vulnerable road users.

Through edge processing, Hayden AI's mobile perception platform identifies and documents potential traffic violations while the bus is moving. The platform then uploads only the data necessary to issue a violation, all while prioritizing data security and streamlining data management. This information is then sent to the MTA for law enforcement to decide the proper recourse. Through its AI-powered tools, Hayden AI also helps drivers proactively move out of the way when approaching a barrier in their bus lane while keeping all road users safe.

Outcomes & Benefits

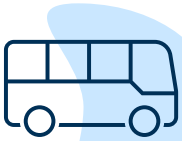
The installation of Hayden AI's technology on Metropolitan Transportation Authority buses has increased both the safety of those on buses and those around them. For example, along the M15-SBS transit route, collisions have been reduced by 34% since automated bus lane enforcement began. [3] Overall, transit speed has increased by as much as 36% on certain routes, enabling buses to stay on schedule while also decreasing vehicle collisions by an average of 20% on streets with routes using this technology. [3] Improving the safety of bus riders and bus operation reliability through more efficient transit speed leads to increases in transit ridership.

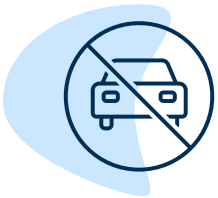
The technology also seems to be impacting driver behavior in a positive way. As of October 2022, 80% of drivers who committed a parking violation in a bus lane did not commit a second violation.



36% increase in transit speed on routes

20% decrease in vehicle collisions on routes





80% of drivers did not repeat parking violations

Conclusion

Using AI detection platforms in transit systems can enable city transportation agencies to improve the efficiency, safety, and accessibility of public transit. Having reliable public transit is a critical resource for residents of New York City, especially for minorities and those with limited mobility.

By identifying and documenting cars that are obstructing bus lanes, AI tools can improve the quality, efficiency, and safety of public transportation options in the U.S. Through innovative solutions like this one in New York City, we can work to make our transportation system smarter and safer for all users.

Participants involved in this use case include Hayden AI and NYC MTA.

Sources:
[1] APTA
[2] New York City Government
[3] Metro Magazine
[4] Hayden AI

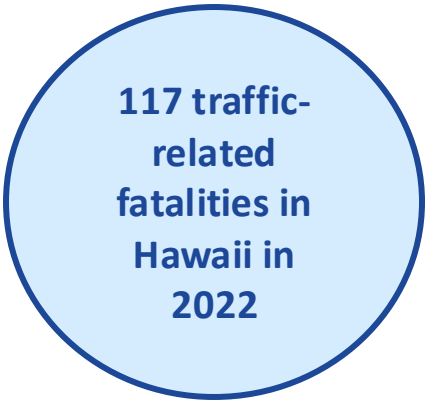
Improving Roadway Maintenance Through Automation

Hawaii

Infrastructure maintenance is critical to ensuring road user safety and preventing potential crashes and fatalities. Roadways are often manually inspected to keep roads from degrading, but this can be time consuming and costly. With the help of ITS technology and AI solutions, such as crowdsource image analysis and machine learning, agencies can move to a more efficient and sustainable method to proactively identify maintenance needs and roadway hazards. AI tools have the power to predict maintenance needs and prolong the life of infrastructure assets in a resource efficient way.

The Challenge

The state of Hawaii experiences numerous unique challenges including aging infrastructure, unpredictable oceanic weather patterns, and a disjointed roadway system. The state has seen a high number of roadway fatalities in recent years. **According to data from the National Highway Traffic Safety Administration (NHTSA, there were 117 traffic-related fatalities in the State of Hawaii in 2022, a significant increase from the 94 fatalities recorded in 2021.** [1] Many of Hawaii's roads were built decades ago and need significant repairs and replacements to prevent further harm. Hawaii's location in the Pacific Ocean makes it vulnerable to extreme weather events, such as hurricanes and flooding, which can damage roadways and make them difficult to travel. Road maintenance is a critical issue that requires continuous attention and investment from the Hawaii Department of Transportation (HDOT). However, this maintenance, historically observed manually, can often be resource intensive.



Technology Solution

To address these challenges, HDOT set out to determine the extent to which manual crew trips, increased CCTV coverage, and manual roadway surveys could be replaced and automated using crowdsource imagery and machine learning. HDOT partnered with Blyncsy to address road maintenance issues within the state. Blyncsy provided crowdsource imagery from dashcams on Hawaii's roadways along with machine learning models to deliver thousands of road images per mile and automatically survey roadways for multiple different assets. These surveys included information on striping visibility, guardrail detection damage, debris, calculating PASER (Pavement Surface Evaluation and Rating) scores, and cracking. Blyncsy stores images for quick access and uses artificial intelligence to analyze imagery to make roadways safer and detect road degradation. The project encompasses 1,013 miles of roadway and covers the four main islands of Hawaii. [2]

Outcomes & Benefits

Agencies across the country are benefitting from cost savings associated with machine vision and AI solutions, freeing up much needed resources for other critical projects. Additionally, by proactively identifying infrastructure flaws and areas in need of repair, agencies can extend the life of their roads and protect road users from unsafe conditions.

By automating maintenance detections and safety inspections, Blyncsy machine vision for roadway maintenance saved HDOT approximately $250,000 per year (compared to the weekly manual surveys) and Blyncsy identified 930 active issues per week. Additionally, Blyncsy also saved HDOT $300,000 through its ability to produce updated information on paint line visibility and PASER scoring. In addition to these cost savings, Blyncsy's work with HDOT to reduce the need for manual surveys by 95% and 23,286 pounds of carbon emissions were eliminated annually for each inspection vehicle that could be removed from the roadway. [3]

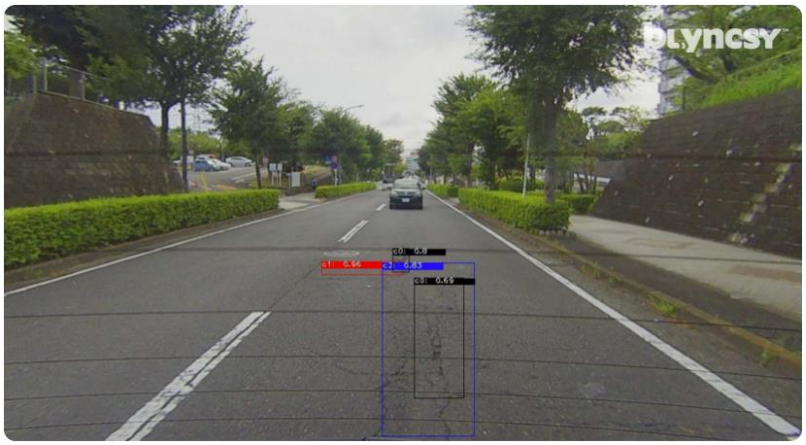


Photo courtesy of Blyncsy.

930
Identified Active Issues per Week

23,286
Pounds of Carbon Emissions Eliminated Annually Per Vehicle

Conclusion

The Hawaii Department of Transportation (HDOT) modernized roadway surveys by utilizing Blyncsy to improve real-time insights into the quality of roadways. Blyncsy's artificial intelligence system reduced the need for manual inspections and provided reliable data. Implementing computer vision technology has been transformative for HDOT, saving time and money as well as improving the safety, sustainability, and efficiency of Hawaii's roadways. Automating maintenance and asset management on roadways is a proactive approach that can reduce fatalities and improve the lifespan of hard infrastructure assets. ITS America supports the use of AI to strengthen our existing road infrastructure as well as improve the transportation safety outcomes.

Participants involved in this use case include Blyncsy and Hawaii Department of Transportation.

Sources:
[1] NHTSA
[2] HDOT
[3] Blyncsy

AI Traffic Management and Incident Detection

Austin, Texas

Decreasing incident response times from police and EMS is crucial to saving lives and improving health outcomes in communities. Using cloud-based software and AI, public safety agencies can share traffic data and real-time updates to help emergency services reach destinations faster. As we look to reach Vision Zero in the U.S., agencies can use AI-based traffic management to lower the incidence of initial crashes and secondary crashes. Agencies can and should invest in digital infrastructure to complement their existing hard infrastructure operations, leveraging innovative technology to increase safety and efficiency.

The Challenge

Every second counts when responding to emergencies, so it is vital that first responders and public safety personnel reach their destinations as quickly and safely as possible. Too often there is a lack of information during incidents or crashes on the road, as people may be distressed and unable to locate themselves. Knowing the right information can help dispatchers send the correct people to the correct location in a timely manner. In 2022 and 2023, Austin-Travis County EMS fell short of their 90% on-time target rate for incidents, with the county most recently hitting the 76% on-time compliance mark in June of 2024. [1] While the agency has contended with staffing shortages and other problems, it is crucial that substandard information and traffic management are not adding to the current response time challenges. When incident response is faster, the likelihood of secondary crashes is reduced. According to a USDOT study, 28% of secondary crashes were due to a road hazard, including a vehicle or non-motorist in the roadway – a common occurrence after a previous crash. [2]

Travis County EMS had an on-time response rate of 76% in June 2024

24% of secondary crashes are due to roadway issues like a prior crash

For a long time, traffic management operations in the Texas Department of Transportation Austin District have depended on roadway incident notifications through siloed and disparate sources. High-quality data and information are critical to transportation operations and emergency response, necessitating innovative solutions for large state transportation agencies.

Technology Solution

The Texas Department of Transportation (TxDOT) worked with Rekor's Command platform to leverage its existing infrastructure and third party data (geospatial, CVD, etc.) to enable AI insights in detecting and responding to incidents faster than ever before, managing its roadways, and tracking/managing the multiple large scale roadway construction projects that are happening simultaneously.

Using Rekor's AI-driven solutions, TxDOT had a comprehensive view of its roadways and new roadway intelligence that improves incident response time and overall roadway safety. The additional data included predictive high-potential crash hotspots, real-time connected vehicle data, and multiple other third-party data sources to alert the transportation agency about incidents including crashes, abandoned vehicles, roadway debris, and more.

Outcomes & Benefits

11 min median decrease in emergency response time

29% reduction in secondary crashes

Rekor's platform in Austin had a reported impact of an 11- minute median decrease in emergency response time, as well as a 29% reduction in secondary crashes. TxDOT also reported a 44-minute average time for traffic to return to normal after incidents on the road. [3, 4] For context, large crashes can often take hours to clear and allow traffic to return to normal. TxDOT at Austin reported an **$8 million** direct reduction in costs while using Rekor's platform. [3, 4]

By using AI-powered platforms like Rekor Command, transportation agencies can proactively plan for the future and address safety hotspots before further incidents emerge. In some instances, agencies may see data on their roads' problem areas that they have never seen before or did not even know was an issue.

Conclusion

With the use of AI-powered traffic management, crashes can be prevented and lives can be saved on our roads. Public agencies can use AI to reduce police and EMS response times and strengthen information gathering methods necessary to keep motorists and pedestrians safe, in addition to managing congestion and traffic flow. TxDOT experienced improvements in operations due to its investment in digital infrastructure tools, and agencies across the country can achieve similar benefits through prioritizing innovative technology solutions that help the U.S. reach Vision Zero. ITS America supports the continued adoption of AI in transportation so that we can fully realize the benefits of life-saving technology and make our system safer and smarter for all.

Participants involved in this use case include Rekor and the Texas Department of Transportation.

Sources:
[1] City of Austin
[2] FHWA
[3] Rekor
[4] Texas Department of Transportation

Using AI to Build Smarter Highways & Corridors

Tennessee

Traffic congestion on highways remains a challenge for state and local authorities, many of which are turning toward innovative, technological solutions to manage traffic and reduce crash rates. As fatality rates on our nation's roads remain stubbornly high, these cutting-edge tools are needed to make a meaningful impact. With the help of AI-powered traffic management tools and variable speed limits, public sector agencies can effectively improve traffic flow on busy highways and proactively address safety problems on the road.

The Challenge

The Tennessee Department of Transportation (TDOT) faced the challenge of reducing crashes and enhancing traffic flow on the busy I-24 highway. **Since 2005, traffic volumes have increased by more than 60% in the Murfreesboro-Rutherford County segments of I-24.** [1] Population growth in the state has been outpacing infrastructure, leading to more traffic congestion. [2] Further widening of the interstate was not financially feasible, nor would it completely solve the congestion issues along the corridor. Traffic congestion on highways can lead to greater risk of injury or death on the road, as well as increased emissions from vehicles, compounding the safety risks for communities. As traffic volumes increase on busy highway corridors, other arterial routes may become congested as well, leading to spillover traffic that reverberates throughout regions.

From 2019-2023, I-24 had the 2nd highest fatality rate per 100 million vehicle miles traveled in the state. [3] Additionally, I-24 connects Nashville, the State's largest city, to other surrounding communities, bringing economic benefits to the region. Efficient, safe travel can strengthen economic benefits to a region, and congested highways hamper the efficient movement of goods and people.

Nine of the country's top 100 freight traffic bottlenecks are located within Tennessee's state borders [2]

Technology Solution

TDOT implemented an AI-Based Decision Support System along the I-24 SMART Corridor to improve traffic management and safety. The I-24 SMART Corridor project integrates freeway and arterial roadway elements, along with physical, technological, and operational improvements, to provide drivers accurate, real-time information and to actively manage traffic.

To address congestion and safety challenges, TDOT utilized data from traffic detectors and cameras, combined with deep learning algorithms, to dynamically generate variable speed limits and diversion routing. These AI-driven decisions aim to smooth traffic flow and reduce the need for abrupt braking, thus minimizing the likelihood of crashes. In addition, TDOT is using overhead gantries to improve lane control and traffic flow.

Outcomes & Benefits

Since the deployment of digital infrastructure and AI tools on the I-24 SMART Corridor, there has been an 8.5% decline in crashes involving injuries or fatalities. [1] While the initial impact on travel times has been limited, TDOT anticipates significant improvements once diversion routing is fully integrated. These digital features coordinate traffic signal systems on alternate routes, aiming to reduce travel times during incidents and alleviate congestion. TDOT expects more consistent commute times to result from these digital enhancements.

8.5% decline in crashes with injuries or fatalities

TDOT has used AI to improve its variable speed limit (VSL) areas, further lowering the risk of crashes. Widespread deployment of VSL or similar digital tools can improve safety by adjusting speed limits to real-time conditions, reducing rear-end and secondary crashes, and inducing better driver behavior.

Photo courtesy of Tennessee DOT.

Conclusion

By employing cutting-edge AI technology, TDOT has made strides in creating a safer, more efficient highway system. The success of the I-24 SMART Corridor serves as a promising example of how technology can enhance traffic management and safety. Better commute times and reliable freight corridors are critical to the economic outcomes of regions, states, and the country, and innovative AI-based solutions can help address our collective congestion challenges. ITS America encourages states across the country to utilize AI and digital infrastructure tools to make highways safer and more efficient for all road users.

Participants involved in this use case include the Tennessee Department of Transportation (TDOT).

Sources:
[1] TDOT
[2] University of Tennessee
[3] The Tennessean

Improving Safety with AI-Powered Intersections

Sarasota, Florida

Challenge

As the number of traffic crashes, injuries, and deaths remain stubbornly high in the United States, communities across the country are looking for solutions to make their roads and residents' safer. The City of Sarasota in Florida was experiencing a rise in traffic volume, as well as a rise in crashes. Even further, the city saw elevated rates of pedestrian and cyclist crashes at left turns, and a rise in vehicle crashes at flashing yellow lights and intersections.

With a growing population, Sarasota saw more traffic volume, leading to more vehicles, bicyclists, and pedestrians on the road – which can often increase the likelihood of a crash. As a way to solve their congestion and safety issues, Sarasota looked to replace their outdated infrastructure and deploy an innovative technology solution to their transportation challenges.

Technology Solution

The City of Sarasota, in partnership with Derq, has taken pioneering steps to advance the city's quality of life through smart technology. In partnership with the Florida Department of Transportation (FDOT), Derq's AI-powered intersection safety system and connected and autonomous vehicle (CAV) technology has been deployed at 16 high-traffic, high-risk intersections across Sarasota to help improve traffic safety and efficiency. This implementation is part of the city's broader initiative to enhance the quality of life through smart technology.

> The city used a data-driven approach to select intersections based on historical crash data and multimodal activity.

The Derq SENSE Connected Vehicle application is the cooperative perception layer that identifies, tracks, and predicts road user trajectories and generates V2X messages to help prevent crashes, reduce blind spots, and protect vulnerable road users. With Sarasota becoming more walkable than ever before, the city's primary objective of the connected transportation project has been to improve safety and efficiency.

The technology facilitates V2X communications between vehicles, pedestrians, bicyclists, infrastructure, traffic management systems, and public agencies.

Key technology features include:

- Real-time V2X messages for connected road users and autonomous vehicles
- Standard compliant V2X messages
- Ultra-low end-to-end latency
- High accuracy detection and tracking of vehicles and vulnerable road users (VRUs)
- Predictive collision avoidance algorithms

Outcomes & Benefits

City officials have been using this as a traffic-calming data program to better understand roadway use and traffic patterns, helping them adjust signal timing and make informed decisions to improve vulnerable road user safety and reduce congestion. After deploying Derq's technology, Sarasota has seen a **33% reduction in crashes YoY (2023 vs 2024), with one intersection experiencing a 90% decrease.** Additional findings included a reduction in citations, suggesting improved compliance with traffic regulations.

The city continues to monitor post-deployment data to guide future improvements in multiple areas—including left-turn phasing, pedestrian intervals, and signal coordination.

Conclusion

Innovative technologies, like V2X and AI, can help solve traffic problems before serious incidents occur. By proactively taking steps to solve their local transportation challenges, Sarasota and its partners saw a marked improvement in crash rates and overall safety. While this may be just one project, this example shows how technology — when scaled — improves safety and efficiency on our roads.

Participants in this use case include Derq Inc. and the City of Sarasota, Florida.

Sources:
[1] City of Sarasota
[2] WFLA
[3] Fox13 News
[4] Derq

ITS AMERICA

ITS Technology Use Case Library:

Digital Infrastructure

Traffic Management and Optimization

Detroit, Michigan

Local transportation systems are the lifeblood of cities, connecting residents to jobs, critical services, family, and friends. Decreasing the time that people sit in traffic and improving the operational health of municipalities are critical aspects to ensuring the functionality of local transportation systems. Using cloud-based software and remote traffic management systems, cities can decrease travel times, improve roadway efficiency, and reduce spending on transportation maintenance costs. Monitoring traffic patterns and intersections not only reduces congestion, but also lowers associated emissions and reduces financial burdens on drivers.

The Challenge

The City of Detroit is synonymous with transportation and the automotive industry and has been a leader in innovation since the early 20th century. Today however, Detroit lacks effective in-ground connectivity when compared to other major cities, making cross-device communication more difficult than necessary. This frequently leaves technicians unaware of issues they could otherwise fix. With a majority of their traffic budget devoted to manual signal checking and repairs, minimal funds are left to address emergency response times and public transit reliability. According to a 2020 study, Detroit drivers spent $3 billion in congestion costs collectively, with each driver spending 35 hours in traffic per year. [1, 2] Congestion like this creates excess fuel consumption and more auto emissions in a city that has been plagued by poor air quality. [3] Data-driven solutions and innovative traffic management tools will help make driving more efficient and improves repair processes.

35 Hours

Amount of time each Detroit driver spent in traffic in 2020

$3 Billion

Collective congestion costs in 2020

Technology Solution

The City of Detroit overcame its challenges by implementing a remote traffic management system based on TrafficLink, an intelligent Amazon Web Services (AWS)–based transportation system platform from Miovision. Relying on intersection data and livestreaming, the city can monitor each intersection and make data-driven decisions to improve traffic. TrafficLink can alert engineers via email or SMS about signal problems, such as light outages, signal timing issues, or signal failures. Traffic engineers can also use Miovision Traffic Insights, a web-based analytics suite, to evaluate signals based on real-time data.

The city deployed the remote traffic management system at 450 intersections and recently added advanced analytics capabilities to 30% of those intersections. Additionally, the Detroit uses analytical data from the Miovision solution to count vehicle traffic and pedestrian volume. This data is used to optimize specific traffic corridors and recognize the impact of road closures. The city and Miovision implemented traffic signal priority and preemption to shorten EMS response times through using pre-existing GPS technology already present in the city's EMS vehicles.

Outcomes & Benefits

Miovision's platform reimagined intersections in Detroit, leading to improvements in maintenance time and costs, as well as travel times at major intersections across the city. Previously, the city had an extensive third-party maintenance contract but now leaders can focus internal resources where they're most needed by taking advantage of connected traffic signals. This partnership continues to keep drivers, pedestrians, and other road users safe in Detroit.

20%
Reduction in traffic signal maintenance costs

30%
Decrease in travel times at major intersections

75%
Reduction in time to resolve traffic signal issues

$1B
Potential savings from less congestion

Additionally, Miovision's systems optimized Detroit's intersections, tracking both driver and pedestrian data to inform the city's systems. For example, their system can recognize when a pedestrian or cyclist is in a dilemma zone and extend the green timer to give them adequate time to cross the road. By creating these pedestrian heat maps, they have generated a blueprint for intersection monitoring that keeps everyone safe no matter how they choose to move. By enhancing Detroit's digital infrastructure, Miovision's technology has improved transportation outcomes for the city and its residents.

Conclusion

By deploying cutting-edge traffic monitoring and optimization tools, we can achieve multiple benefits that extend beyond transportation and improve the health of local economies. These tools achieve the goals of lower congestion, reduced emissions, and enhanced efficiency of travel times, while lowering costs for municipalities. These savings could be redirected to support critical community needs that would otherwise go unmet. Through Miovision's traffic management solution, Detroit was able to upgrade their digital and physical infrastructure in a cost-efficient manner, while improving congestion at intersections and making roads safer. ITS America encourages the implementation of similar traffic optimization and management tools in cities across the country so that we can help people get to their destinations safely and efficiently.

Participants involved in this use case include Miovision and the City of Detroit.

Sources:
[1] Texas A&M University Transportation Institute
[2] Miovision; AWS
[3] American Lung Association

Improving Bridge Travel Times With Lane Management

Richmond, California

The management of traffic patterns on highways is critical to the ease of travel and congestion costs for motorists and surrounding communities. When it comes to toll-based bridges, too much traffic can lead to even greater congestion on the bridge and surrounding highway arteries, potentially leading to more crashes, higher vehicle emissions, and slower travel times. With the correct digital tools, agencies can improve travel times on bridges.

The Challenge

The Richmond-San Rafael Bridge connects the city of Richmond in Contra Costa County with the city of San Rafael in Marin County, through a narrow section of water between the San Francisco and San Pablo bays. It remains the second longest bridge in California, with a length of four miles. For much of its length, the structure has upper and lower decks rather than having side-by-side decks. Westbound traffic is carried on the upper deck while eastbound traffic is carried on the lower deck.

The Richmond-San Rafael Bridge is the **2nd longest** in California

In 2015, the bridge carried an average peak daily traffic flow of about 82,000 vehicles. This increased to 87,000 vehicles in 2017. During a typical weekday, travel demand on the bridge is highly directional, with traffic mainly moving westbound towards Marin County in the morning and eastbound towards Richmond during the afternoon peak. The width of the bridge can accommodate three lanes of traffic in each direction with no emergency shoulder. The eastbound side however experienced a significant increase in congestion during the afternoon due to increased traffic. In this case, the congestion was primarily caused by a reduction in the number of traffic lanes as the right most lane converts to an exit near the bridge's end. Traffic merging onto the freeway through a very short acceleration lane also contributed to the problem. Opening the shoulder as a third lane in the eastbound direction during the PM peak to ease bridge congestion required innovative digital infrastructure and active traffic management systems.

Average peak daily flow of **87,000 vehicles** in 2017

Congestion costs drivers **billions** of dollars each year

Technology Solution

To communicate the operational mode of the lanes, a set of Lane Use Signs (LUS) were installed over the three lanes at 20 locations. These LUS indicate a green arrow, if the lane is open to traffic, and red X if the lane is closed to traffic. In some instances, the LUS display a yellow X, to indicate that traffic should merge with the adjacent lane. The LUS change based on a pre-configured sequence whereby each set of LUS is delayed by a configurable period relative to the previous set for each change in mode and direction.

In addition, there are two full matrix Variable Message Signs (VMS) on the west end of the bridge that communicate traffic and road conditions to the motorists. The VMS are also used to convey hours of operation when the third lane is open or closed on the bridge. The VMS are controlled automatically and manually and will be synchronized to the operations of the LUS. This active traffic management system is managed by operators using the region's ATMS at the Caltrans Traffic Management Center (TMC) and Bay Area Toll Authority's (BATA's) Regional Operations Center (ROC) in San Francisco.

Outcomes & Benefits

The introduction of digital Lane Use Signs and Variable Message Signs has resulted in decreased congestion on the Richmond-San Rafael Bridge and improved travel times for drivers. The extra traffic lane has increased eastbound peak hourly flow across the bridge by 13-26%. The added peak-hour capacity has ended congestion on the Marin County approach to the bridge, resulting in peak travel times from the US-101 to the toll plaza dropping by 13-14 minutes on weekdays, 10-14 minutes on Saturdays, and 6-8 minutes on Sundays.

Weekday afternoon peak travel times along Sir Francis Drake Boulevard have dropped by up to 4 minutes, while traffic volumes have increased by over 300 vehicles/hour. The opening of the eastbound shoulder to traffic has reduced by approximately 70% the frequency of incidents on the eastbound bridge approach. With such improved traffic flows on the bridge and surrounding highways, the bridge has seen improved driver experience.

13-26%
Increase in eastbound bridge hourly flow

70%
Decrease in incidents on eastbound approach

13-14 Min.
Decrease in peak weekday travel times

Conclusion

Changing traffic patterns through digital infrastructure tools such as Lane Use and Variable Message Signs can result in lower travel times, less congestion on highways, and financial savings for motorists. As these digital tools improve traffic flow on the Richmond-San Rafael Bridge, drivers may face fewer backups, decreased idle fuel use, and the potential for fewer crashes. ITS America supports the implementation of active traffic management systems and innovative technological solutions that ease congestion on bridges, such as these tactics employed by California, so that we can realize a world with safer roads, fewer crashes, less congestion, and stronger transportation networks.

Participants involved in this use case include Caltrans District 4, Metropolitan Transportation Commission (MTC), Bay Area Toll Authority (BATA), Contra Costa Transportation Authority (CCTA), and Transportation Authority of Marin (TAM).

Sources:
[1] Caltrans

Using Active Traffic Management & Dynamic Lanes

Southeast Michigan

Improving safety outcomes on roads and decreasing travel times is critical to easing congestion and maintaining a region's economic competitiveness. Congestion on highways and inefficient lane use can have significant impacts on driver and pedestrian safety, as well as negative effects on the environment and fuel costs. Using advanced active traffic management (ATM) tools and upgrading digital infrastructure on highways can lead to improvements in safety and roadway efficiency.

The Challenge

Highway congestion adds time to commutes and leads to billions of dollars in collective costs to drivers every year. Without proper traffic management, these problems can compound and impact arterial roads as well. In 2022, drivers across the U.S. spent an average of 51 hours in traffic jams, costing the average driver over $800 in lost time. Overall, Michigan households collectively face $5.5 billion in annual traffic congestion costs. [1] As congestion increases, so does the likelihood of crashes and tailpipe emissions from vehicles.

Michigan saw over 293,000 crashes in 2022, which is 15% higher than in 2018. [2] The state, like many others, faces an urgent need to reduce crashes and fatalities on its roadways. Easing congestion through innovative, flexible shoulder lanes and digital tools, the state is making progress toward lowering the number of crashes on its highways and improving travel times in busy regions.

293,000 crashes in 2022 in MI

Over **$5B** in congestion costs for MI households

Technology Solution

ATM aims to dynamically manage recurrent and non-recurrent congestion based on prevailing and predicted traffic conditions. The Michigan Department of Transportation (MDOT) opened a Flex route on US Route 23 in 2017 to mitigate peak-hour congestion, reduce incident response times, and improve safety. The route uses large shoulders as dynamic lanes, spanning over 8 miles long. MDOT manages the corridor with variable speed controls and queue warning systems, opening the shoulder lanes in both northbound and southbound directions during peak traffic. This includes recurring peak travel times, as well as non-recurrent times such as holidays and local collegiate sports games. MDOT's Flex lanes on US Route 23 operate with the main goal of reducing travel times, improving congestion, and lowering the number of crashes on the highway. Another goal was to keep speeds along the US-23 dynamic stretch at 60 MPH when the Flex route is in operation to accommodate 66,000 vehicles per day.

Outcomes & Benefits

This is an ongoing, permanent fixture on US Route 23 in the metropolitan Detroit region, but so far, the Flex route has improved driver safety, reduced travel times, and has received public praise from road users. Incident response times from emergency personnel improved along the route, as well as general congestion in both directions. Using before and after analysis, researchers found the following results of the Flex route: Crashes were reduced by 50% in the southbound direction during peak operational times and 17% in total after the Flex route was put in place. After the Flex route went into operation, average travel times during peak periods were reduced by 16.5% and 11.2% in the southbound and northbound directions, respectively. The introduction of the Flex route saw more traffic flow as well, with the maximum throughput in the northbound direction increasing by 11% and in the southbound direction by 35.4%.

50% reduction in southbound crashes

16.5% decrease in southbound travel time

11.2% decrease in northbound travel time

35.4% increase in southbound traffic flow

Conclusion

By implementing a Flex route and accompanying digital infrastructure on a busy highway, MDOT was able to reduce travel times, congestion, and improve safety outcomes. With lower congestion, drivers can lower fuel consumption and potentially save money as well. Using ATM is just one of many ways of using digital infrastructure tools and ITS technologies to strengthen transportation networks and move closer to achieving Vision Zero. ITS America supports the continued use of ATM tools to reach these Vision Zero goals and a world where transportation is safer, greener, and smarter for all.

Participants involved in this use case include Michigan Department of Transportation.

Sources:

[1] Fox 2 News
[2] Click on Detroit
[2] ITS JPO

Analyzing Crash Data Using AI and Digital Twins

Sarasota, Florida

Local decisionmakers rely on accurate and accessible transportation data to protect people on our roadways and improve their communities. Transformative technology solutions such as artificial intelligence and digital infrastructure are key to bridging gaps in data and providing analysis that will improve transportation system safety and help local agencies make informed decisions. Gathering and analyzing accurate crash data using AI can lead to improvements in city planning and safety outcomes on roads across the country.

The Challenge

The Sarasota-Manatee Metropolitan Planning Organization (MPO) has experienced rapid growth in population, with over 830,000 residents today compared to 489,000 in 1990. As the number of vehicles on roadways increased due to the rapid population growth, the MPO struggled to refine its traffic data and use this data effectively in safety improvement planning. Limits in accurate data made it difficult for the Sarasota-Manatee MPO to implement safety programs and address safety concerns. Gathering highly accurate data and having the tools to clean, refine, and analyze the data are all necessary parts of implementing data-driven safety decisions. **With over 100 fatal crashes in the Sarasota-Manatee area in 2021 alone, closing data gaps is crucial to prevent further crashes from occurring.** [1]

Technology Solution

The Sarasota-Manatee MPO now uses Citian's CRASH platform as an added digital infrastructure layer to close data gaps and to help expedite traffic safety analysis, reporting, and operations using their system. This AI-based safety tool identifies and addresses existing data gaps, focuses attention on immediate actionable insights, and generates solution strategies to improve the accuracy, completeness, and usability of crash data. The CRASH platform closes these gaps through incorporating multiple, diverse data sets and then layers crash analysis, predictive analytics, and automation to expedite engineering workflow.

CRASH powers network screening, intersection, segment and corridor analysis, before-and-after studies, statistical safety analysis, countermeasure recommendations, and implementation analysis to automate, expedite, and enhance their safety operations. Using machine learning and a digital twin environment, the system allows the Sarasota-Manatee MPO to explore crash data.

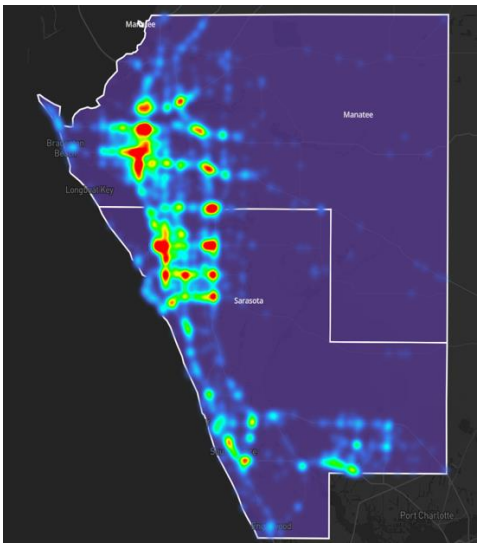


Photo courtesy of Citian.

Outcomes & Benefits

Through this partnership, the Sarasota-Manatee MPO traffic safety staff has been able to better understand regional and local patterns in crash data and respond quickly to urgent safety needs. The adoption of CRASH has transformed Sarasota-Manatee's transportation system from having a reactive approach to one that proactively looks to improve safety outcomes. Safety evaluations and active transportation planning are completed more quickly than ever before, improving productivity and reducing reliance on expensive manual work. In one project alone, the CRASH platform saved the Sarasota-Manatee MPO thousands of labor hours by streamlining the creation of a public-facing traffic safety dashboard. [2] Typically, it would have taken weeks to refine and review crash data spreadsheets. Through CRASH, the dashboard was created in one afternoon and the time that would have been taken on this project was redirected to making important policy decisions.

In one project alone, the CRASH platform saved the Sarasota-Manatee MPO thousands in labor hours by streamlining the creation of a public-facing traffic safety dashboard.

Conclusion

AI and digital infrastructure tools can be used to modernize, refine, and complete crash data for state and local transportation systems. By implementing the CRASH platform throughout its counties, the Sarasota-Manatee MPO was able to reduce the costs and time associated with manual safety evaluations. The added digital layer allows the agency to work toward preventing more crashes by having complete crash data sets to analyze beforehand and data to make informed safety countermeasure decisions. As we look at achieving Vision Zero, ITS America supports the continued adoption of digital infrastructure tools that help agencies gather and analyze important transportation data.

Participants involved in this use case include Citian and the Sarasota-Manatee MPO.

Sources:
[1] Sarasota-Manatee MPO
[2] Citian

Using Digital Infrastructure Data to Improve Accessibility

Helena, Montana

As cities confront transportation challenges in the 21st century, data about their transportation networks and infrastructure is crucial to making informed decisions. Managing assets can be time consuming, but with digital infrastructure technologies, cities are able to quickly identify problem areas, operationalize their assets, and make improvements to their infrastructure. Through sound infrastructure management and improvements, cities can strengthen accessibility for pedestrians, maintain ADA compliance, and proactively make streets safer for all users.

The Challenge

Even with a decline in overall number of traffic fatalities, pedestrian safety and access remains a challenge in cities across the U.S. For those with accessibility challenges and impairments, safe and easy access to sidewalks and streets can be an even bigger challenge, with infrastructure playing a key role. Maintaining safe and accessible transportation infrastructure for vulnerable road users and those with impaired mobility can be resource and time intensive for mid-sized cities like Helena, Montana. . Collecting accurate and precise data remains a challenge for local transportation authorities.

Additionally, Montana had the fifth highest traffic fatality rate per capita in the country in 2021. **From 2017 to 2021, 1,008 people were killed in traffic crashes in Montana.** [1] It is imperative that local and state governments proactively address the safety crisis on the road and invest in the tools necessary to keep people safe – inside and outside of the vehicle.

Technology Solution

The City of Helena, Montana worked with Citian to develop a holistic and comprehensive transportation network asset management system software to fully understand pedestrian accessibility and ADA compliance in Montana's Capital. This digital twin creation showcases cutting-edge data collection and data refinement technologies.

Citian developed a prioritized list of right-of-way (ROW) assets and launched Citian's ADAPT digital maintenance management system in Helena to operationalize its transportation network assets. Citian used a detailed LiDAR scan of approximately 260 miles of City roads and leveraged ADAPT's artificial intelligence to automatically extract over 20,000 assets and their related measurements. Sidewalks, bike facilities, curb ramps, curbs, gutters, signage, road cross slopes, road striping, and more were captured, evaluated, and used to populate the comprehensive digital twin environment. Users can view all relevant details for any asset scanned across their network, including comprehensive ADA compliance status and the cost to remediate any issues. Users can further monitor total network compliance, conduct top-down analysis of assets for top corridors, and generate automated remediation plans for any selection of ROW assets across the City.

Outcomes & Benefits

The automated extraction process of ROW assets for ADA compliance significantly expedited deliverable completion, leading to major time and cost savings for Helena. If Helena were to perform this type of asset inventory using a traditional boots-on-the-ground approach, the city would have spent thousands of dollars more and it would have taken many more months, if not years to develop an asset inventory. It would have taken even longer to develop the operational toolset to use this data effectively. In contrast, Citian was able to scan Helena's roadway network in three weeks, delivering a final inventory and operational tool (ADAPT) within three months. City staff were able to leverage ADAPT to generate data-driven insights, prioritize budgets and capital planning, develop dashboards to monitor performance, and process work orders. Helena uses insights generated in ADAPT to invest equitably across their pedestrian network, closing sidewalk gaps and addressing compliance challenges in priority areas.

Digital twinning tools, along with AI, have the power to provide immense safety and accessibility benefits to communities across the country. By streamlining asset management and accurate data collection, Helena is able to proactively address safety concerns before larger problems arise, while improving the quality of life for its residents – especially those with accessibility challenges.

Using Citian's digital infrastructure tools, Helena has saved time and money on transportation asset management.

Conclusion

Using technology to maintain and manage transportation assets can not only improve internal operations for cities and transportation agencies, but also outcomes for entire communities. Having complete and accurate data on their infrastructure assets, cities can proactively identify problem areas and create safety countermeasures – all powered by digital infrastructure and AI. By continuing to adopt digital infrastructure tools, agencies across the country are making their streets safer and creating more accessible, livable communities.

Participants involved in this use case include Citian, City of Helena, and Tectonic Engineering Consultants, Geologists & Land Surveyors, D.P.C.

Sources:
[1] TRIP
[2] Citian

Optimizing Traffic Flow on Congested Highways

Bay Area, California

Throughout the country, highway congestion in metropolitan areas remains a challenge for state and local transportation and planning authorities. Traffic backups make commutes longer, lead to more tailpipe emissions, and have the potential for more crashes. With the help of ITS technology and digital infrastructure tools, agencies can better manage traffic flow, detect and prevent incidents, and get people to destinations safely and efficiently.

The Challenge

Highway congestion adds time to commutes and leads to billions of dollars in collective costs to drivers every year. In California, 87% of urban Interstate highways are considered congested during peak hours, the highest share in the U.S. Additionally, vehicle travel on California's Interstates increased 17% from 2000 to 2019. The Interstate 80 (I-80) corridor in the California Bay Area has continuously ranked as one of the most congested corridors in the entire San Francisco Bay Area. As of 2007, with traffic volumes reaching 312,000 vehicles per day and an average of 20,000 hours of delay daily. The freeway is at or near capacity during peak periods with many segments of the corridor operating poorly. The congestion on the roadway network contributes to an increase in crash rates, including rear-end crashes on both freeway and local arterials. The combined effect of the crashes and the congestion hinders efficient response ties and creates secondary crashes.

Technology Solution

The primary goal of the I-80 ICM Project was to enhance the current Transportation Management System along the I-80 corridor.

87% of CA highways are congested during peak hours

312,000+ vehicles per day on I-80 corridor

This was accomplished by building balanced, responsive, equitable, and integrated system to monitor and maintain optimum traffic flow along the network, thereby improving the safety and mobility for all users, including transit riders. This project used State-of-the-Practice ITS technologies to enhance the effectiveness of the existing transportation network in both freeway and parallel arterials in Alameda and Contra Costa Counties. Caltrans and other local transportation authorities improved active traffic management systems, including variable advisory speed signs, lane use signs, and adaptive ramp metering to optimize traffic flow and decrease collisions. Additionally, the project implemented transit signal priority, coordinated traffic systems on arterial roads, changeable message signs, CCTV cameras, and other vehicle detection systems, all designed to optimize traffic flow, decrease travel times, and limit congestion from crashes.

The I-80 ICM project consisted of multiple systems and strategies, working collectively, to address congestion and mobility: including the challenges of imbalanced traffic flow in the corridor. Most of the systems were integrated into a single ATMS for unified management of the corridor and overall region. Since this corridor is constrained on both sides (by water and development), the most feasible congestion management alternative was to improve the efficiency of the total transportation system.

Outcomes & Benefits

The Project produced significant safety and travel time benefits despite significant traffic growth. The collected data shows that the I-80 SMART Corridor Project produced safety and mobility benefits by implementing advanced traffic management strategies, including ramp metering, traveler information and incident-related diversion facilitation. The benefits were most noticeable during the off-peak and fringes of peak periods. For the year, the I-80 SMART Corridor Project nearly halted increases in peak period congestion despite the increase in traffic demand and overall VMT on I-80. The project also reduced crashes in the westbound direction where traffic management activities are highest with the overhead gantries with lane use signs and additional changeable message signs. This contrasts the Bay Area trends where traffic collision incidents increased.

The project **nearly halted** peak period congestion on I-80

Traffic collisions were **reduced** on the SMART corridor

Traffic collisions in the westbound direction in 2017 were reduced when compared 2016. Westbound I-80 is where traffic and incident management activities were highest with the overhead gantries and electronic message signs. In comparison, in other parts of the Bay Area, there were increases in collisions, which averaged around 10 % in total over the last three years. The Project almost halted increases in peak period congestion despite the increase in traffic volumes and overall VMT.

Conclusion

With the help of active traffic management, lane use signs, and other ITS technology, Caltrans and local California transportation agencies were able to improve congestion and reduce collisions on the severely congested I-80 corridor in the Bay Area. ITS America encourages other agencies across the country, big or small, to implement similar measures to upgrade transportation digital infrastructure. With ITS technologies, we can reduce congestion on highways, prevent crashes, and look toward a safer future in highway transportation.

Participants involved in this use case include Caltrans District 4, Metropolitan Transportation Commission (MTC, Alameda County Transportation Commission (ACTC, Contra Costa Transportation Authority (CCTA, West Contra Costa Transportation Advisory Committee (WCCTAC, Alameda County Transit, and major cities along the corridor.

Sources:

[1] TripNet
[2] Caltrans

Decreasing Wrong Way Driving on Expressways

Tampa, Florida

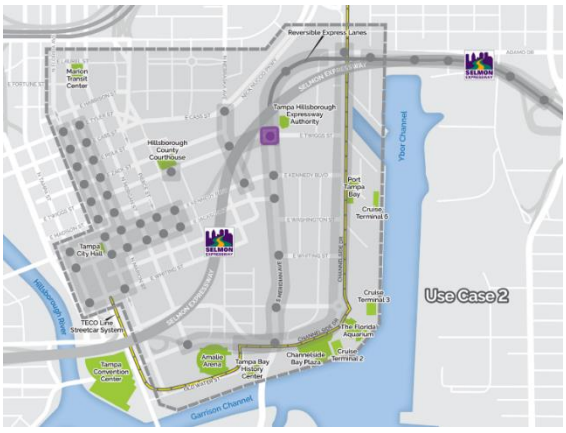
Wrong-way driving on expressways or other busy roads is a serious problem in both urban and rural areas, leading to crashes and fatalities. Drivers going the incorrect way on a road are often impaired through alcohol or other substances and are driving alone. With a robust digital infrastructure in place to alert drivers that they are entering the wrong way on a road, we can reduce crashes and make our roads safer.

The Challenge

According to the latest data analysis from the AAA Foundation for Traffic Safety, there were **2,008 deaths from wrong-way driving crashes on divided highways between 2015 and 2018, an average of approximately 500 deaths a year.** With 87% of wrong-way drivers operating the vehicle without a passenger, there is a need for a technological solution to alert drivers, especially those who may be impaired. The Tampa Central Business District has encountered a wrong way driving problem, putting drivers at severe risk of crashes. At the exit to the Reversible Express Lanes (REL) on East Twiggs Street, there is a relatively easy opportunity for a driver to become confused and attempt to enter the REL going the wrong way. There are no gates or barriers at the REL exit to prevent drivers from entering the REL going the wrong way. Drivers traveling on East Twiggs Street approaching the intersection where the REL ends and Meridian Street begins can mistakenly enter the REL going the wrong way. Drivers approaching this intersection coming from downtown can inadvertently make a left turn onto the REL exit. Additionally, drivers on East Twiggs Street approaching this intersection going towards downtown can inadvertently make a right turn onto the REL exit. Finally, drivers approaching the intersection on Meridian can potentially veer slightly to the left onto the REL exit.

Technology Solution

The Tampa Hillsborough Expressway Authority (THEA) is trying to eliminate wrong-way driving by working with other public and private partners to help keep drivers safe. To detect potential wrong way drivers, messages are broadcast at the REL/Twiggs/Meridian Intersection. Within the signal message, the revocable lane bit is set for the wrong way lanes. If a vehicle starts to move into the REL going the wrong way, the OBU Wrong Way Entry application (could this be said an on-board unit with a Wrong Way Entry detection application) determines the vehicle is entering a revoked lane and issues a warning to the driver that they are about to enter the Wrong Way. If the driver continues up the REL, the OBU Wrong Way Entry application alerts the driver they are going the wrong way. The purple square on the image shows where the Wrong Way project was implemented.



Outcomes & Benefits

THEA's implementation of digital alerting has led to the detection and stopping of numerous wrong-way driving incidents, with lives potentially saved. Analysis showed in the PM peak period (3 p.m. to 12 a.m. weekdays), the application correctly warned drivers of entering the wrong way and identified 14 participants of 19 potentially true conflicts. The AM period (6 a.m. to 10 a.m. weekdays) did not experience a single wrong-way occurrence during the entire deployment. Adoption of this technology can make our roads safer during the day and night, with this urban deployment showcasing the ability to mitigate wrong-way incidents in crowded areas with numerous interchanges.

During a 9-hour period, the system detected **14** wrong-way drivers

Conclusion

The deployment of digital technology tools to limit crashes and stop wrong-way driving in its tracks has undoubtedly saved lives in the Tampa area. This technology, if deployed across the country, has the possibility of preventing more unnecessary injuries and deaths on our roads. The partnership between THEA and other private and public entities is a model for other organizations that wish to implement digital infrastructure tools and deploy ITS technologies. ITS America supports the deployment of such technology and the continued work of public agencies across the country as we look to reach our Vision Zero goal.

Participants involved in this use case include Tampa Hillsborough Expressway Authority, City of Tampa, Florida Department of Transportation (FDOT) District 7 (D7), HNTB, Yunex, Savari, Sirius XM, DENSO, Honda, Hyundai, Toyota.

Sources:

[1] AAA
[2] THEA

Smart Work Zone Systems

Clark County, Washington

Roadway work zones are necessary to maintain the transportation network for mobility, safety, and productivity. State and local agencies are able to make these zones more efficient through ITS tools. Technologies can detect and help mitigate queues, manage speeds, reduce worker exposure, gather performance data, identify and facilitate responding to incidents quickly, inform road users of traffic conditions, improve the visibility of traffic controls in work zones, improve road user and worker safety, and inform future work zone strategies.

The Challenge

Work zones play a vital role in improving our nation's roads and keeping infrastructure safe for users of all types. However, daily changes in traffic patterns, narrowed lanes, and other construction activities often create a combination of factors resulting in crashes, injuries, and fatalities. These crashes also cause excessive delays, especially in constrained driving environments. Between 2020 and 2021, work zone fatalities increased by 10.8% while overall roadway fatalities increased by 10.3%. [1] The American Society of Civil Engineers estimate that congestion caused by construction zones leads to $25 billion in costs in the U.S. alone, with the average American spending 54 hours in traffic congestion each year. [2] During construction on I-5 in Clark County, Washington, the project required southbound traffic to be reduced to two lanes during the daytime and one lane during nighttime operations for three weeks. As projects get longer and available lanes decrease, there is a chance of higher congestion, longer commute times, and crashes.

$25 BILLION

Annual cost of construction-caused congestion in the U.S.

10.8%

Increase in work zone fatalities between 2020 and 2021

Technology Solution

To address anticipated work zone-related queuing and associated delay and safety risks, adopting a smart work zone system can be used to mitigate the effects of temporary traffic closures. This long-term, stationary lane closure on I-5 southbound included the following ITS solutions: Travel Delay Information provided motorists with the most accurate real-time delay available; Traffic Queue Warning to alert motorists upcoming traffic backups – especially in the case of sight distance restrictions; Zipper Merge (Late Merge) was encouraged through messaging in advance of the merge and at the merge point.

Outcomes & Benefits

A smart work zone can bring many benefits to a busy highway or road, and this example from Clark County in Washington is no different. After implementing smart work zone tools, the I-5 project saw reduced queueing due to work zone activity, travel time savings, better congestion management, and safety improvements.

The I-5 smart work zone led to zero injuries from both workers and road users, improved travel times bolstered by a rolling queue, and an early finish to the project. This saved the Washington DOT $5.5 million in costs, easing burdens on the agency and taxpayers.

$5.5M SAVED

Construction finished 6 days ahead of schedule

ZERO INJURIES

No one (workers and road users) were hurt during the project

Conclusion

Washington's deployment of smart work zone technologies led to improved transportation outcomes along the I-5 route, with construction completed days in advance of its original target and travel times bettered through technology at the site. With advanced warning, drivers could choose alternate routes to avoid delays in work zones or be better prepared to brake for an upcoming slowdown. ITS America supports the use of digital infrastructure tools such as smart work zones to lower congestion and choke points at construction sites, maintain safety, and keep roads operating efficiently.

Participants involved in this use case include Washington State Department of Transportation.

Sources:

[1] Federal Highway Administration
[2] UtilitiesOne
[3] WSDOT

Protecting Pedestrians with Lidar and AI

Bellevue, Washington

When considering road safety, protecting vulnerable road users (VRUs) should be a priority for government agencies. Pedestrians and cyclists are more likely to be injured by motor vehicles than other drivers or passengers, and it is imperative that cities and states act proactively to stop these incidents from occurring before they happen. Using technologies such as lidar, advanced analytics, and artificial intelligence (AI), transportation agencies can accurately account for pedestrians and other VRUs and enact safety countermeasures which keep them out of harm's way.

The Challenge

While there has been some modest progress toward decreasing the number of traffic fatalities per year in the U.S., VRUs are still at an increasing risk of injury or death from motor vehicle crashes. Cities across the country are grappling with the challenge of how to keep pedestrians, bicyclists, and disadvantaged members of the community safe. In 2020, the city of Bellevue, Washington (outside Seattle) launched its Vision Zero Strategic Plan, laying out how the city will implement the Safe Systems Approach to eliminate crashes, serious injuries, and fatalities on their roads by 2030. **They found that 83% of fatal or serious injury crashes occurred on just 8% of the city's street network, while almost half of traffic fatalities since 2014 have been vulnerable road users**. [1] The city found that from 2014-2023, not granting right-of-way to vehicles, distracted driving, speeding, drivers failing to yield to non-motorists, and impairment through alcohol or drugs were the primary causes in 71% of all fatal and serious injury crashes.

72% of pedestrian-related fatalities and serious injuries in Bellevue occurred at the city's intersections. With failing to yield to a non-motorist and other dangerous incidents most likely occurring at crosswalks, a proactive approach to intersection safety was needed to prevent crashes before they happen. By piloting pedestrian detection software, the city can see their intersections more clearly, understand the causes of crashes, and assist pedestrians with reaching their destinations safely.

72% of pedestrian-related fatalities and serious injuries occurred at Bellevue *intersections*

83% of fatal or serious injury crashes occurred on just 8% of the city's street network

Technology Solution

Seeking to address pedestrian safety issues, the city of Bellevue worked with Ouster, AWS, and other companies to launch its Passive Pedestrian Detection Phase Extension Pilot – a demonstration that used a combination of advanced analytics, AI, lidar, and other sensors at signalized intersections to improve pedestrian safety and identify when a pedestrian needed extra time to cross the street. Using lidar sensors from Ouster, the city was able to identify and track objects across an intersection, allowing controllers to see when a signal phase needed to be extended to help pedestrians cross and stop oncoming traffic. Ouster's lidar system was able to provide a comprehensive 3D map of an entire intersection. Using AI to determine if a pedestrian was detected in the crosswalk and what the phase was (Stop or Walk), the traffic signal phase is then either extended or operated as normal phase procedure. Finally, if there was an emergency vehicle, the signal interval can be terminated early to serve the emergency vehicle as quickly as possible.

Outcomes & Benefits

By piloting the Passive Pedestrian Detection technology, the city of Bellevue was able to more accurately detect pedestrians in crosswalks and hold signals for them to finish crossing the street at some of the busiest intersections in the city. The city had a detection success rate above 80% and is looking forward to improving these numbers through additional adjustments to the data used in the algorithms and improvements in machine learning capabilities. In part due to this pilot, Bellevue was awarded a SMART Grant from USDOT in March 2024, helping fund the city's Real- Time Traffic Signal Safety Interventions Project

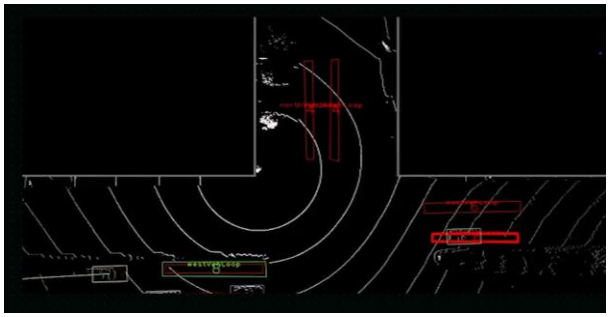


Photo courtesy of Ouster.

Conclusion

Adopting innovative technology such as lidar and AI can help cities mitigate crashes and act proactively to address safety problems on their roads. This pilot project in Bellevue demonstrated the potential of using multiple technology applications to help vulnerable road users remain safe when crossing at intersections, and it is just the beginning of using digital infrastructure to provide better outcomes for communities. ITS America supports the integration of AI and other technology tools to prevent future injuries and deaths on our nation's roads, and it is projects like these that demonstrate the potential for transformative change in our national transportation system.

Participants involved in this use case include the City of Bellevue, WA, Ouster, AWS, AMAG, Outsight, Blue-Band, and SCATS.

Sources:
[1] City of Bellevue
[2] Ouster [Michael Montoya, National Account Executive]

Safer Highways with Variable Speed Limits

Virginia

Unsafe speeds and congestion are two leading causes of crashes on highways in the United States. Not only does traffic congestion slow commute and freight travel, but it can also lead to unsafe driving, secondary crashes, and further traffic on arterial roads. Using technology to control and change speeds in response to road conditions, highway operators can dynamically improve travel times in real time, helping drivers reach their destinations quicker and reduce the chance of injury or fatal crashes on busy highways.

The Challenge

Traffic congestion on highways poses serious safety, environmental, and economic challenges to states across the country. Not only are commutes longer, but valuable freight and shipping corridors become negatively impacted by rising levels of congestion on highways. Virginia's I-95 corridor is one of the most heavily trafficked in the nation and is known for congestion caused by crashes and delays during busy commuting hours, on weekends, and during the summer travel season. More than just a nuisance, traffic congestion can cause harm to an area's economic growth potential, create safety hazards, and increase traffic levels on arterial roads, creating even larger issues in the surrounding communities.

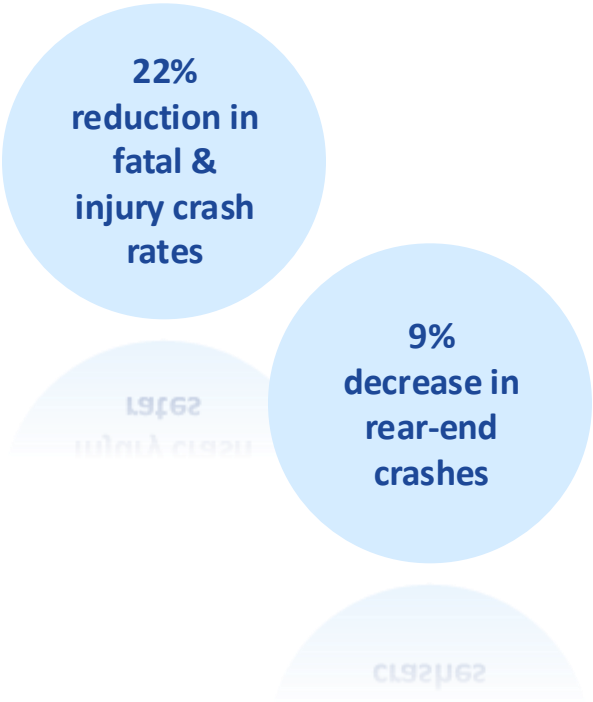
Slower speeds on highways have also been shown to reduce the potential for crashes and fatalities. **According to the Governors Highway Safety Association (GHSA), there were 12,151 deaths in speeding-related crashes in 2022.** [1] With variable speed limits, drivers will be encouraged to slow their speeds, creating a safer roadway environment for all road users, including work zone and roadside workers who are often in harm's way due to unsafe speeds.

Technology Solution

Variable speed limits (VSL) are a great digital tool that can be used to manage speed dynamically on highways in urban and rural areas alike, adjusting to real-time conditions and stabilizing traffic flow, especially when crashes, work zones, or poor weather conditions are present. VSL signs replace traditional speed limit signs to reduce speed limits based on real-time traffic conditions. VDOT's VSL system uses a custom algorithm based on data from traffic detectors to identify a speed limit (between 35 MPH and 70 MPH) that will best harmonize traffic flow. It anticipates the onset of congestion based on the detector data to proactively reduce speeds and maintain free-flow speeds. It also gradually slows traffic as it approaches congestion to reduce the risk of crashes. VDOT has deployed VSL on northbound I-95 in Spotsylvania, pairing LED signs displaying variable speed limits between 40 MPH and 70 MPH with dynamic message boards

Outcomes & Benefits

Data from June 2022 to February 2023 showed reduced crash rates for all types of crashes compared with the same period a year earlier, including a 22% reduction in fatal and injury crash rates and a 9% reduction in rear-end crash rates. Data from this same period also showed a decrease in speeding behavior when the speed limit is posted at a reduced limit of 55 MPH based on comparable conditions in the prior year. The variable speed limits resulted in 22% fewer vehicles traveling 10+ MPH over the speed limit. In addition, the variance of speeds between vehicles and across lanes is reduced, signifying a change in driver behavior. Drivers may still need to reduce their speed in this area due to congestion, but they are encountering fewer sudden stops with less hard braking as the VSL signs gradually move travelers to more stable speeds.



Widespread deployment of VSL or similar digital tools can improve safety by adjusting speed limits to real-time conditions, reducing rear-end and secondary crashes, and inducing better driver behavior.

Conclusion

Virginia's deployment of VSL has been shown to decrease the incidence of crashes on certain stretches of the busy I-95 highway, while also inducing lower speeds from drivers. VSL is another important ITS technology that can help dynamically alleviate congestion and improve safety for road users across the country. Expanding digital infrastructure tools like VSL can be a promising method to promote safe driving behavior, reduce crash rates, and strengthen economic outcomes for areas that experience high levels of traffic congestion. ITS America encourages transportation authorities to invest in dynamic speed technologies and other digital innovations that will help reach our shared Vision Zero, efficiency, and environmental goals.

Participants involved in this use case include Virginia Department of Transportation.

Sources:
[1] GHSA
[2] VDOT
[3] NOCOE

Improving Safety on Tribal Roads

Toppenish, Washington

Deploying life-saving ITS technology requires strong coordination between the public and private sector, along with ample funding for projects such as intersection cameras, new safety databases, and signal integration. However, many rural communities lack the resources necessary to implement these technologies. Therefore, there's an urgent need for a cost-effective roadside sensing and alerting system tailored to tribal and rural communities that can automate data collection, monitor traffic and road conditions, detect hazards, and issue timely warnings.

The Challenge

Tribal and rural communities face a disproportionately higher burden of safety challenges. According to NHTSA, the fatality rate per 100 million vehicle miles traveled was two times higher in rural areas than in urban areas (2018). The disparity becomes even more stark when considering Native American populations. In rural regions, the absence of essential infrastructure such as broadband internet and fiber optics impedes the deployment of advanced surveillance systems and conventional data collection methods. Moreover, they lack the technical personnel and technologies required for effective data management, visualization, and analysis.

The Yakama Nation reservation has about 1,200 miles of public roads, predominantly situated within rural agricultural settings. Unfortunately, Yakima County bears the highest rates of both motor vehicle and pedestrian fatalities for Native American and Alaskan Native (NA/AN) populations in Washington. Data scarcity hinders effective planning and decision-making processes. Moreover, when applying for grants or funding opportunities, the absence of comprehensive data undermines the credibility of their proposals and reduces the chances of securing financial support.

Did you know?

A Native American/Alaska Native active transportation user is almost FIVE times more likely to be a traffic death victim compared to all other races.

Native Americans in Washington bear a disproportionate burden of traffic crashes, with a fatality rate 4.1 times higher than non-Native Americans. [1]

Technology Solution

Yakama Nation DNR Engineering initiated collaborative efforts with organizations including University of Washington, Washington State Department of Transportation (WSDOT), and AIWaysion.

Leveraging the power of advanced sensing and computing technologies, they developed and implemented an innovative solution to monitor traffic and roadway conditions, driving environments, and enhance real-time warning systems. Yakama Nation installed AIWaysion's Mobile Unit for Sensing Traffic (MUST) devices, which is a cost-effective Edge AI sensing device, at the intersection where the highway meets local roads, as part of a pilot project to improve traffic safety on U.S. Highway 97. The MUST device is equipped with multi-sensing (i.e., camera, environment sensors, etc.), computing, and communication capabilities, making it ideal for monitoring traffic, detecting dangerous events, and providing real-time warning messages to road users. MUST devices can operate without relying on extensive infrastructure support, such as a broadband connection. This aspect is particularly advantageous in tribal and rural environments where access to reliable and high-speed internet connectivity may be limited or unavailable.

Outcomes & Benefits

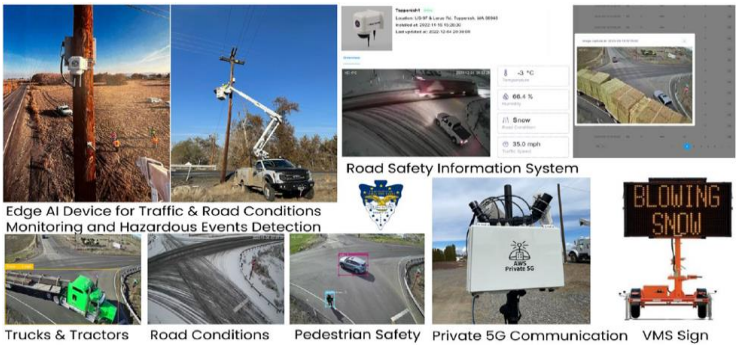
The MUST device can perform advanced processing and analysis of data directly at the roadside. This eliminates the need for continuous and costly data transmission to a centralized server or cloud infrastructure, reducing the dependence on a broadband connection and minimizing latency issues. The device can efficiently process and analyze the collected data in real-time, enabling immediate detection of hazardous events and timely dissemination of warning messages to road users. Since the data processing and analysis occur locally on the device itself, there is no need for transmitting sensitive or personal data to external servers or cloud platforms. This ensures the privacy and security of the communities, as their data remains localized and within their control. The project successfully collected traffic safety data for local roads in the Yakama Nation, providing valuable insights into road conditions and potential hazards.

24/7 Real-Time Traffic and Roadway Information

- This reduced the need for unnecessary on-site visits, allowing for efficient remote monitoring and immediate responses to potential hazards.

Local Traffic Safety Data Owned by the Tribe

- Yakama Nation now possesses ownership of local traffic safety data that serves their specific needs, such as pedestrian safety, collision/near-miss events, semi-truck and agricultural vehicles activities, heavy fog/low visibility, adverse roadway surface conditions, etc. This data serves as a valuable asset for the tribe, supporting data-driven traffic planning initiatives.



The development of a Safety Data Portal enabled efficient management, analysis, and visualization of the safety data collected by the MUST devices, supporting evidence-based decision-making. The deployment also demonstrated the feasibility of cost-effective, low-power devices for real-time monitoring, contributing to a reduction in the need for costly infrastructure and high-speed internet connectivity.

Conclusion

It is critical that rural, isolated, tribal, or indigenous communities across the country leverage ITS technologies to implement safety measures on roads and mitigate costs. Effective collaboration and strong engagement with community stakeholders, including tribes, state and local DOTs, and the federal government are critical to the success and sustainability of ITS projects. ITS America supports digital infrastructure projects that make our roads safer like this one in the Yakama Nation and improves the lives of rural communities across the country.

Participants involved in this use case include AIWaysion, Yakama Nation Department of Natural Resources, University of Washington, Washington State Department of Transportation.

Sources:

[1] Washington State Traffic Commission [2} AIWaysion, Yakama Nation DNR

Streamlining Freight Weigh Station Operations

Florida

With an estimated $389 billion impact to the U.S. economy, trucking is a critical part of our nation's infrastructure and movement of goods. [1] Federal and state agencies ensure that freight operations and roads are safe and efficient, delivering for both local and the national economies. Improving freight operations through digital infrastructure will enhance cost savings for the industry, increase supply chain reliability, and improve the conditions of our roads.

The Challenge

The movement of goods by commercial motor vehicles (CMV) in Florida continues to grow and, according to the 2020 Freight Mobility and Trade Plan, is projected to increase over 33%, from 651,334 KTons in 2017 to 870,136 KTons in 2045. This creates a need to improve transportation networks (physical and digital) to continue to safely and efficiently move commodities. Currently, there is limited data exchange or management of connectivity between freight modes, namely seaports, airports, spaceports, rail terminals, distribution centers, and roadway infrastructure. With freight transportation contributing billions of dollars to the U.S. economy every year, comprehensive digital infrastructure is required to manage the travel of goods and ensure resources are used efficiently.

33% increase in goods movement by CMVs by 2045, putting more strain on roads

Weigh stations, which serve to protect the integrity, resiliency and safety of the transportation network, are a critical component of highway freight. Such stops, while important for safety, can increase trip times and lead to truck congestion on off ramps to the stations. In the past in Florida, CMVs were required to be screened for size and weight compliance at each encountered weigh station. This requires CMV to exit the roadway and enter the facility for verification of size and weight compliance. Further, when multiple weigh stations were encountered along a route, the CMV was required to be processed by each independent facility. Using robust data exchange networks and weight-in-motion (WIM) technology, trucks could bypass most stations, leading to less congestion, improved route performance, and greater roadway efficiency.

Technology Solution

The Florida Department of Transportation (FDOT) has systematically developed and deployed technology solutions to provide the safe and efficient movement of freight. The solution deployed, the Freight Operations Exchange (FOX), serves as a central data management platform for driving advanced analytics in support of increasing the safety and mobility of commercial motor vehicles and multimodal connectivity. With this technique, FDOT can better monitor highway performance, truck communication, and freight weights.

FOX also included mainline WIM that includes license plate recognition, USDOT number readers, and over height detection for trucks. The FOX system reads, stores, analyzes and presents data for agency use in screening vehicles for inspection, reducing the workload of staff, even as CMV freight travel increases. By leveraging data as gathered through daily operations, algorithms are being developed that will allow trucks previously screened and found in compliance to bypass subsequent weigh stations.

Outcomes & Benefits

The initial goal of the solution was to increase the bypass of CMV found compliant with size and weight regulations from 31% as measured in 2019 and which only verified safety information provided by third party vendors, to 50% based on the aforementioned criteria. The initial results indicate that the mainline WIM is resulting in greater than 60% bypass of compliant vehicles. As the mainline WIM deployment continues and the FOX system expands, the ability to preprocess previously verified CMVs will be implemented. This will leverage other installations for information such as travel time between facilities. The effort has expanded to include a partnership between FDOT, Florida Highway Safety and Motor Vehicles and Georgia State Patrol to exchange information to increase the safety and mobility at a regional level.

60% of compliant trucks can bypass weigh station under the new digital system, a **93% increase** from 2019

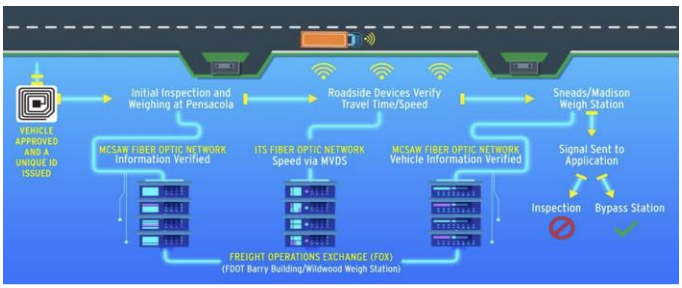


Photo courtesy of Florida DOT.

The safety gains associated with this use case have not been measured. However, as fewer trucks are required to exit and re-enter the roadway network at the weigh stations, it is expected that there will be reduced chance of crashes. Additionally, environmental benefits, such as reduced noise and emissions, are expected as fewer trucks are required to start and stop at the weigh stations.

Conclusion

Building off the initial success of the integrated technology solutions, FOX is continuing development in support multi-modal goods mobility applications. Digital infrastructure such as FOX helps streamline weigh-in-motion systems, allowing more efficient transportation of freight on U.S. highways and less congestion at weigh stations. ITS America encourages more innovation and adoption in the digital infrastructure space so that our transportation system is safer, greener, smarter, and more equitable. Florida's new digital freight management platform and improvements to weigh-in-motion stations has made roads safer, improved freight efficiency, and strengthened the state's highway system.

Participants involved in this use case include the Florida Department of Transportation, HNTB, and Mettler Toledo.

Sources:
[1] Bureau of Transportation Statistics, USDOT
[2] Florida Department of Transportation
[3] National Operations Center of Excellence

Creating A Centralized Transportation Data Hub

Utah

Proper data management and modern technologies are vital to the success of state and local transportation departments, creating a cohesive environment for collaboration and streamlining operations. By leveraging innovative digital tools, agencies can use advanced analytics to spot trends, solve problems, and improve safety and travel outcomes on all forms of transportation in a jurisdiction. A strong digital infrastructure keeps transportation networks operating smoothly and its users safe.

The Challenge

The Utah Department of Transportation (UDOT) is tasked with a broad collection of responsibilities relating to transportation within the State of Utah. From road construction and maintenance to traffic management, aircraft registration, and ski lift inspections, UDOT's activities are focused on the central mission of "Keeping Utah Moving." All of these activities create enormous amounts of data, but this data was stored in siloed structures. These siloes do not give the department the ability to perform high-level trend analysis or leverage technologies built around advanced analytics and machine learning.

Technology Solution

UDOT developed a strategy to centralize all their data into a new Advanced Data Analytics Platform (ADAP). Partnering with Atos (formerly CloudReach), UDOT created a Cloud Plan with Google Public Sector to implement ADAP. By harnessing and curating UDOT's distributed data, the team began to build a "Chain of Trust" from source systems to endpoint applications. Knowing what the data is, where it came from, when it was gathered, who is responsible for it, and how to gain access to the data is critical to providing the correct data in a timely manner for any use case. UDOT's Data Lake will provide a platform to store raw data, apply logical transformations to standardize formats and types, apply business rules to enhance quality and comprehension, capture metadata, and provide access. In addition to the management and quality enhancement of the data, access and exploration of the datasets will also be a core function of the platform.

As part of the overall strategy to centralize their data, UDOT is developing an analytics program that will support the agency's core functions. UDOT requires a platform that will support the volumes of historical information and the continuous flow of information they receive from roadways, partners, and business systems in order to accomplish this program. The analytics will be able to help UDOT resolve a number of issues, ranging from "Where can I store this information" to "What factors most impact congestion at Point of the Mountain on I-15?"

Outcomes & Benefits

In order to improve the utilization of resources, UDOT worked with Google Cloud to deconstruct data silos, improve the discoverability of assets, onboard large volumes of data, support complex and data-intensive analytics and modeling, and introduce artificial intelligence (AI) capabilities to all agency functions. The new ADAP provides an unprecedented environment for storing, cataloging, managing, and sharing data from across the entire agency with internal business groups, applications, other agencies, and the public. The cloud-based platform is scalable and provides the speed, storage, and processing capabilities needed for analytics use cases for today and the future. With the help of Google Cloud, UDOT will be able to create a centralized dataset to alleviate data gathering and curation efforts for public requests. This includes the following technical aspects:

Data science and modeling using the centralized platform includes: access to large quantities of data (statistically significant volume and history of data) and data sources (researching and testing factors that may influence the models); tools for analysis (Looker Studio, Looker Pro, R, Python, distributed file storage, distributed computing, visualization tools, etc.); computing power to test, modify, and iterate on the models (real-time data processing, distributed computing environment).

Using Jackalope, a software platform, they see the following benefits: Provides average annual daily traffic (AADT) information for 6,500+ segments of roadway; Receives data from continuous count locations (CCS) and short-term sensor locations; Applies annualized factors to data to alleviate inconsistencies in sensor data

Technical dependencies include: 1.5 TB, including historic records; The previous database shares hardware hosted with another application, slowing the speed of response and impacting other applications during large data queries

Conclusion

By standardizing the data interface across the UDOT portfolio of applications, downstream applications will be able to analyze and understand data at an accelerated pace. New insights, not currently realizable due to the siloed datasets, can be realized, and access to the data can be readily provided to external parties. More complete, easily accessible data can lead to more efficiency and safety on the road. ITS America supports the use of AI and innovative software solutions that will modernize an agency's digital infrastructure and strengthen their ability to respond to incidents and create a safe transportation environment.

Participants involved in this use case include Google, Utah Department of Transportation.

Sources:
[1] Google

Building a Modern Traffic Management System

Colorado

Robust digital infrastructure is key to improving road safety, traffic management, and incident response in a state with a varied landscape like Colorado. Modernizing data storage and analytics platforms helps state DOTs and local agencies pinpoint issues on the road more efficiently and can keep the public informed about roadway conditions. Improved data management and collection can lead to reduced costs, efficient operations, and safer roads.

The Challenge

The Colorado Department of Transportation (CDOT) faced a significant challenge with their existing digital infrastructure. With the responsibility of managing over 23,000 miles of highway, overseeing the safety of more than 35,000 miles of county roads and 35 mountain passes, and handling approximately 3,000 vehicle crashes each year, system limitations impact everything from operational capabilities to traffic management, safety, and response times to incidents. The existing traffic management system, which is crucial for collecting and disseminating real-time traffic information, was built on legacy technology that limited data sharing and integration, creating data silos. Similarly, the existing database solution, essential for analyzing transportation data and supporting decision-making, was not able to process large volumes of data efficiently.

23,000 miles of highway

35,000 miles of country roads

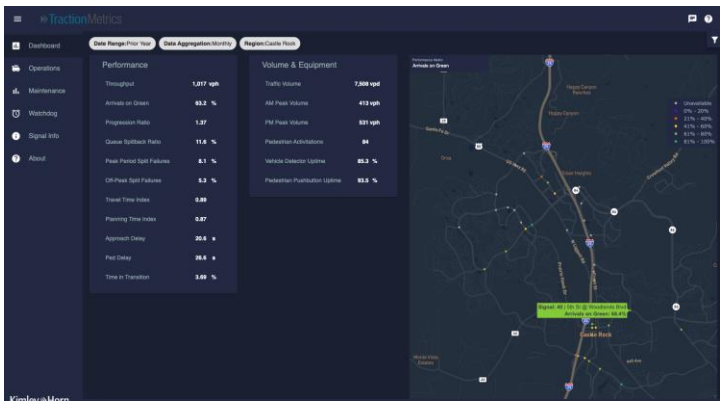
Technology Solution

To address these challenges, CDOT worked with Google Cloud to develop an up-to-date Real-Time Data Hub (RTDH) and Advanced Data Analytics Platform (ADAP) capable of handling the increasing demands of modern transportation management. These platforms created an intelligent transportation system designed to improve safety and mobility, utilizing cloud storage, BigQuery, and analytics capabilities from Google Cloud. By collecting data along their roadways to produce valuable digital information for intelligence and analytics.

CDOT was able to connect legacy datasets with new datasets, consolidate disparate data sources, and introduce multiple third-party data sources. The modernized RTDH now allows for seamless data integration from multiple sources, including traffic sensors, cameras, and weather stations. This integration is crucial for providing a comprehensive view of the transportation landscape in real time. The ADAP leverages advanced data processing capabilities and machine learning algorithms to analyze traffic patterns, identify trends, and support data-driven decision-making.

Outcomes & Benefits

CDOT integrated multiple platforms, including the Work Zone Sata Exchange (WZDx), Connected Vehicle Data Exchange, and Advanced Traffic Management System (ATMS) into a single common platform, allowing data to flow and insights to be generated across the department. **They were able to utilize information, analyze it, and make decisions from 23,000 lane miles of roadway, and 488 cameras converted to real-time monitoring and end-points.** With the ability to make data-driven decisions, CDOT was able to optimize roadways, improve traffic flows and increase safety. With the upgraded ADAP, CDOT can process and analyze large datasets more efficiently, leading to better-informed decisions and strategies. One of the most significant results is the ability to utilize analytics. By analyzing historical and real-time data, CDOT can now forecast traffic conditions with greater accuracy. This capability allows preemptive measures to be taken, reducing the likelihood of collisions and congestion and improving overall road safety



Photos courtesy of Google.

Conclusion

The Colorado Department of Transportation (CDOT) modernized its digital infrastructure using Google Cloud to improve operational efficiency, reduce costs, and improve safety. Implementing the modernized RTDH and ADAP has been a transformative experience for CDOT, positively impacting the safety and well-being of Colorado's traveling public. CDOT's enterprise data approach gives traffic operators a single integrated real-time view instead of 10 windows of various data. It has enabled data access, transparency, and usability, all while building for future data scalability. ITS America encourages further public agency and private sector partner collaboration in the realm of digital infrastructure, so that we can build a smarter, safer transportation system for all.

Participants involved in this use case include Google, Colorado Department of Transportation.

Sources:
[1] Google

Improving Road Illumination with TxDOT

Fort Worth, Texas

Roadway lighting is critical to the safety of motorist and pedestrians alike, keeping people and vehicles in sight. Maintaining and repairing a strong illumination system on highways is cost and labor intensive, requiring innovative solutions to improve the speed of repairs and keep costs to a minimum. Digital infrastructure tools can help state and local DOTs manage their illumination system and keep the lights on.

The Challenge

Roadway illumination is a critical facet of safety for drivers, pedestrians, and other vulnerable road users. Too much or too powerful lighting can be a distraction for motorists, potentially leading to crashes and congestion. Meanwhile, dim lighting or no illumination at all hampers visibility for drivers of pedestrians, other vehicles, road hazards, and sharp turns. While only one quarter of driving happens at night, close to 50% of traffic fatalities happen at night. [1]

Did you know?
We do only 25% of our driving at night, but 50% of traffic deaths happen at night.

Improving lighting where visibility is poor could lead to a 35% reduction in crashes.[2] Highway lighting installation is expensive and energy intensive, however, so it is important that installation and usage is done efficiently. In Fort Worth, Texas, the Texas Department of Transportation (TxDOT) noticed that in one year, over $2 million dollars' worth of copper wiring from lighting systems was stolen, resulting in a 40% loss of illumination from TxDOT managed systems. Replacing stolen materials and replacing outages requires an increase in night-time hours for workers, is often untimely, and happens at a substantial cost to the state.

Technology Solution

Electricians at TxDOT designed a prototype device to remotely read the voltage on a particular circuit, with a low voltage reading indicating an issue a particular light's illumination levels. Working with a private sector vendor, TxDOT developed an application to remotely sense outages in illumination, with the ability to see how many LEDs went out and where it took place. Alerts are then sent to local personnel for repairs. Using this innovative technology, testing can be done remotely, reducing the amount of time and physical resources needed onsite from TxDOT, lowering costs for the agency.

Outcomes & Benefits

The Fort Worth area saw an improved lighting on roadways, with less outages after the remote technology solution was put in place. The district has seen lower costs, and ultimately a decreased burden on taxpayers to repair outages and replace stolen wiring. **This includes an 89% increase in active lighting up-time and a 40% reduction in repair costs.**

Conclusion

By deploying an innovative technology, TxDOT was able to improve roadway lighting while reducing costs – a win for drivers and the agency. By detecting outages faster and accurately, they can spend less time traveling and repairing and could use money for other projects. ITS America supports a strong digital network to maintain our physical infrastructure and increase our road safety.

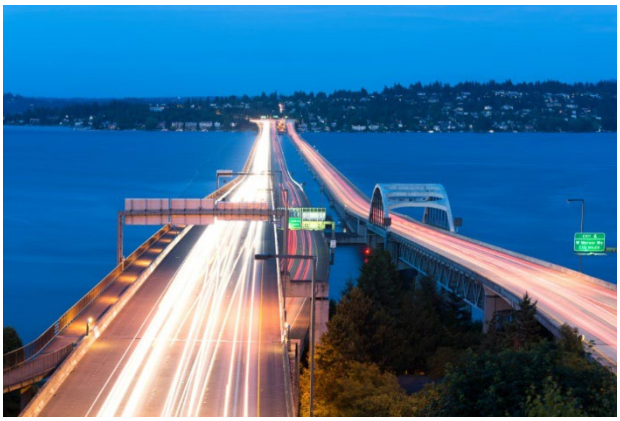
Sources:
[1] National Safety Council
[2] ITASS Research

Digital Twin-Aided Bridge Evaluations

Seattle, Washington

The Challenge

According to the American Road and Transportation Builders Association (ARTBA), 1 in 3 bridges in the U.S. are in need of repair, and over 42,000 are rated in poor condition. Such a high volume and gravity of bridge rehabilitation necessitates proper bridge inspection and the need to use all the tools available to inspect, maintain, and repair across the U.S. The maintenance and inspection process, however, can be time-consuming and costly, leading to inefficiencies and a backlog of assets in need of repair. Typically, the current condition of assets (and the identification of any issues) is assessed through visual inspection and thus depends on the experience and judgment of the inspector. Maintenance and repair decisions follow these inspections and are based on the observed conditions. Given the large uncertainty and limits of the data available, this procedure has the potential either to be unduly conservative, and therefore waste precious resources through premature maintenance actions, or to miss anomalous behavior, which might lead to emergency work when the issue becomes problematic.



Technology Solution

In order to better manage their bridge assets, Washington State Department of Transportation is investing in digital twin technology to better manage their bridges and glean insights into their safety. This particular proof- of-technology project deploys IoT sensors on the Interstate 90 Homer Hadley floating bridge across Lake Washington between Seattle and Mercer Island. Additional attention is warranted because of the new demands imposed on the structure by trains operating on the East Link light rail extension in the coming years.

In order to better manage their bridge assets, Washington State Department of Transportation is investing in digital twin technology to better manage their bridges and glean insights into their safety.

Performance of the floating bridges is sensitive to many more inputs, and depends on many more response quantities, than a more conventional bridge. This makes them ideal candidates for applying digital twin technology, particularly because the interplay between different measured quantities, such as anchor cable forces and lateral bridge movement, cannot be examined using present methods.

Outcomes & Benefits

This proof-of-technology project provides:

- Near real-time, integrated data on the conditions of the Homer Hadley Memorial Bridge, which can be used to inform operational decisions about bridge closures.
- Alerts sent to operations and maintenance personnel when anomalies and issues are identified by the sensors (e.g., threshold water level in pontoon).
- Digital alignment guidance for seasonal anchor cable adjustments to correspond with lake level changes.
- A historical record of cable stresses, correlated to bridge position, on which to base future seasonal adjustments to anchor cable tensions.

Conclusion

This project will help WSDOT determine how to use digital twinning technology and IoT sensors across many more bridges and roadway assets in their state. Using this type of technology helps the agency collect critical data about the performance of their hard infrastructure assets – allowing them to make more informed, data-driven decisions that will ultimately make roads safer, save the agency time and money, and improve the resiliency of bridges across Washington.

As we continue to look for ways to maximize our return on infrastructure investments and improve our physical infrastructure, technology can help us get the most out of our physical infrastructure.

Participants in this use case include Washington Department of Transportation, University of Washington, Microsoft, Bentley Systems, WSP USA, T-Mobile, and the Federal Highway Administration

Sources:
[1] University of Washington

Using Radar Detection for Intersection Safety

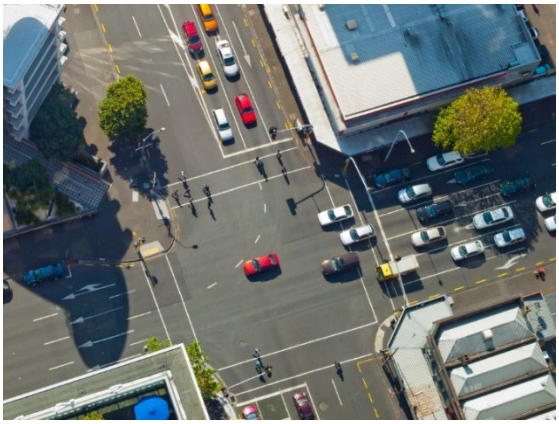
Central Ohio

The Challenge

Intersections across the country are often hotspots for vehicle crashes, injuries, and deaths. Communities in Ohio were facing increases in crashes and injuries at many intersections and looking for solutions to mitigate these challenges. From 2019 –2023, one intersection at State Road 16 and Licking Valley Road in Ohio saw 37 crashes with 14% resulting in injuries. At another intersection involving State Road 16, there were 21 crashes and 38% of them resulting in injuries, 15 of which were rear-end crashes and 6 were from red-light running.

In addition, legacy infrastructure and technology systems are often barriers to achieving better road safety outcomes and reducing the incidence of crashes.

In these areas of Ohio along SR 16, “Prepare to Stop When Flashing” signs were reaching the end of their lifespan and becoming outdated by new technological capabilities.

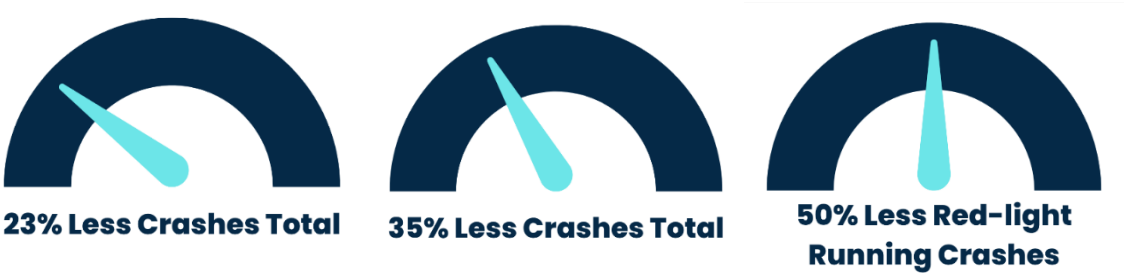


The Ohio Department of Transportation took action to help prevent more crashes and injuries at these intersections by deploying radar-based detection systems that would more closely monitor vehicle speed and adjust traffic signals accordingly.

Technology Solution

ODOT replaced the older signage with an advanced radar system that would detect vehicles from up to 900 feet away. These detectors would look for gaps in traffic where it was safe to switch the signal from red to yellow to green based on traffic conditions. According to ODOT, under the older signal system, cars would actually speed up instead of slowing down when the “Prepare to Stop When Flashing Sign” turned on. **The new radar-based system aims to decrease the incidence of red light-running in these localities and across the state as a whole.**

Outcomes & Benefits



While results were not immediately available from the identified intersections on SR-16, ODOT has seen significant safety improvements from using radar-based sensors at intersections. 23% fewer total crashes; 50% fewer red-light running crashes; 35% fewer serious crashes. Another location in Ohio, this time on State Road 32, showed a 39% reduction in crashes after removing the older system and implementing the advanced technology.

Conclusion

By investing in smarter, more connected intersection technology, Ohio DOT has been able to reduce the number of crashes and injuries at intersections across the state.

Even small changes to the way we manage traffic and signal operations can save lives on the road. It is important that states and localities continue to invest in upgrading their legacy infrastructure and use all the tools available, including technology, to improve safety outcomes.

Participants in this use case include the Ohio Department of Transportation.

Sources:
[1] Ohio DOT

Inspecting Infrastructure with UAS

Michigan

Challenge

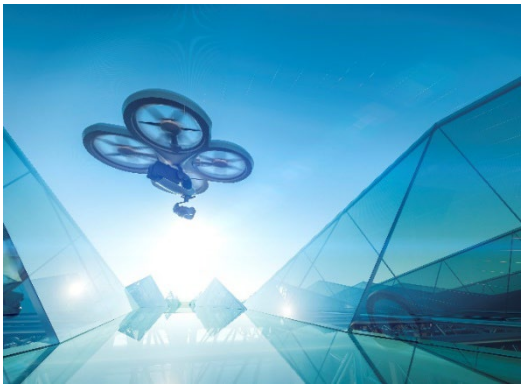
The Michigan Department of Transportation's (MDOT) Ancillary Structures (AS) Program is a first-of-its-kind program performing comprehensive asset management providing real time data regarding ancillary structure inventory and inspection. The program began in 2020 and provides MDOT Region Staff ancillary structure maintenance needs and issues support. Many ancillary structures support advanced technology devices such as V2X, ITS, communications, and advanced traffic signals. Maintaining these structures is critical to ensure that the underlying devices can continue to perform their important functions.

Without strong asset management systems and advanced technology using real-time data, agencies may lack insight into their transportation network. This impacts not only the efficacy of their digital and physical infrastructure assets but also may lead to safety issues on the road. Previously, no singular database has been used to store or track information on these critical assets. As structures are inspected and inventoried into this new program, MDOT staff are now able to obtain and share real-time information on asset conditions, inspection progress, requests for action and more.

Technology Solution

The Ancillary Structures program centers on the development and maintenance of an asset management system and database framework that will account for 70,000+ ancillary structures across the state. The Ancillary Structures program has implemented several technologies to support the efficient collection and analysis of ancillary structure asset data.

HNTB, along with MDOT, has also implemented the use of unmanned aerial systems (UAS), or drones, to assist with inspections of communication towers and high-mast lighting towers that usually require special equipment on-site and certified inspectors to climb the asset. With the use of UAS, inspections are completed more efficiently by capturing an in-depth, accurate assessment of the entire asset with high-resolution images and videos. This innovation improves safety and reduces the time required to complete an inspection and can be used to supplement any design tasks on these assets in the future.



The UAS data collection includes lidar, GPS, video, and photogrammetry. The combined dataset is processed into a 3D mesh model with photo overlay and used by inspectors to perform virtual inspections. Th 3D digital twin of the structural asset can also be included in other immersive/XR technology to conduct safe, efficient training.

Outcomes & Benefits

Increased Inspector Safety

Increased Inspection Frequency

Reduced Regulatory Hurdles

Conclusion

The use of innovative technologies like drones has already transformed how agencies plan, monitor, and construct their transportation network and road infrastructure.

Combined with lidar, digital twinning, and even artificial intelligence, this layered technology approach helps maintain infrastructure safety and resilience, while making the asset management process more sophisticated and efficient.

ITS America supports the continued use of drones and digital tools to improve the way transportation agencies manage and inspect their assets and create safety improvements.

Participants in this use case include HNTB and Michigan Department of Transportation.

Sources:
[1] HNTB

ITS AMERICA

ITS Technology Use Case Library:

Automated Vehicles

Improving Rural Mobility with Automated Vehicles

Itasca County, Minnesota

Access to safe, reliable transportation is not equal across the country, particularly in rural areas with low population densities. Efficient transportation solutions such as automated vehicles (AVs) are able to bridge this mobility gap, providing transportation to those who face accessibility challenges. With decreased potential for driver error in AVs, deploying automated technology can help make our communities safer and enhance the well-being of residents. By using AV shuttles as a mobility-on-demand option, we can improve well-being and economic opportunity.

The Challenge

Rural communities across the country face unique transportation challenges, including unpredictable weather, lower tax bases, and long distances between homes and businesses. With low population densities, cities may lack reliable fixed-route public transit options and face a shortage of resources to build sufficient infrastructure, especially for the disadvantaged. The elderly, low-income, and disabled communities are some of the most challenged when it comes to accessing safe, reliable transportation.

Rural communities, such as Grand Rapids, Minnesota, deal with challenging weather conditions, a lack of app-based rideshare services, and a socioeconomically disadvantaged population. For rural counties across the United States with no concentrated core population of 10,000 people or greater, 18% lived with a disability in 2019, a 17.71% increase from five years prior. In Itasca County, Minnesota, which contains Grand Rapids, 17% of residents lived with a disability in 2020. In the city, over 24% of residents are ages 65+. [2]

18.2% of residents are below the poverty line

17% of Itasca County residents live with a disability

24.6% of Grand Rapids residents are ages 65+

AV technologies are increasingly capable of helping rural residents access transportation options for grocery trips, medical appointments, jobs, social services, and more. AV shuttles help people maintain some independence while connecting them to that they need most in a safe, reliable manner.

Technology Solution

In fall of 2022, goMARTI (Minnesota's Autonomous Rural Transit Initiative) launched in Grand Rapids, MN as part of a partnership among the Minnesota Department of Transportation, City of Grand Rapids, The Plum Catalyst, Via, May Mobility, and other non-profit organizations. Using a hybrid-electric Toyota Sienna Autono-MaaS, Via's AI-based booking and routing algorithms match riders headed in the same direction to create flexible shared trips to more than 70 pick-up and drop-off locations throughout the city, including schools, grocery stores, resource centers, churches, and busy intersections. The automated vehicles, which can be dispatched by an app in minutes or by calling 211, are also free to ride, and operate Tuesday through Sunday. [3] The service is point-to-point, providing a safe means of transportation for those who may not have other reliable and affordable options.

Outcomes & Benefits

After the initial 18-month pilot deployment in 2022, GoMARTI has been extended for 3 years through the Federal Highway Administration's ATTAIN program and will continue to serve thousands of people from the Grand Rapids and Itasca County communities. The service has received positive reviews from riders and strong buy-in from the local community, with 88% of users being repeated riders. Given the safety benefits of AVs and the mobility-on-demand functionality, goMARTI has enabled safer and more reliable transportation for all residents, but most importantly those who have mobility challenges. About 10% of all rides on goMARTI thus far have been for people with wheelchairs, underscoring the impact on the disabled. The following statistics (since Sept. 2022) highlight how widely the service has been utilized in a city of just under 11,000 people, striving toward goals of transit efficiency and mobility for all:

5,456 Riders

88% Repeat Riders

34% HOV Rides

10 Minute Avg. Wait Time

Conclusion

Deploying AV shuttles in rural areas helps connect people to critical resources and community members, helping the local economy grow while bridging the mobility gap for disadvantaged residents. As the first rural large-scale launch of a public AV shuttle pilot, goMARTI is working to transform mobility in northern Minnesota. goMARTI shows how AV shuttle pilots and public-private partnerships can create safe, reliable, and affordable means of transit-on-demand in small towns across America. ITS America supports the continued deployment of AVs to create more equitable communities, help those with mobility challenges reach their destinations, and make our roads safer and more efficient.

Participants involved in this use case include the Minnesota Department of Transportation, City of Grand Rapids, MN, The Plum Catalyst, Via, May Mobility, Arrowhead Transit, Grand Rapids Area Chamber of Commerce, Itasca Economic Development Corporation, Blandin Foundation, MobilityMania, Grand Rapids Community Foundation, University of Minnesota, Itasca Community College, and Next Pathways.

Sources:

[1] Bureau of Transportation Statistics, USDOT
[2] The Plum Catalyst
[3] Daily Yonder

Automated Vehicles for Last Mile Mobility

Columbus, Ohio

Decreasing the number of barriers to mobility and improving the safety and efficiency of roads in our communities are important goals but are not without challenges. Efficient transportation solutions such as automated vehicles (AVs) are able to bridge the mobility gap, providing transportation in the "last mile" to those who face mobility challenges and improving the efficiency of goods delivery. With decreased potential for driver error in AVs, deploying automated technology can help make our communities safer and enhance the well-being of residents, helping them reach food, healthcare, and family.

The Challenge

Changing commuter habits, population density shifts, lack of reliable public transportation can negatively affect cities across the United States. For example, Ohio residents who use public transportation spend an extra 76% of their commuting to work than those who do not take public transit options, an example of a common theme across America. [1] Mid-sized cities like Columbus, Ohio are no different and face their own set of transportation challenges. Beyond commuting challenges into the city, those within the city limits may face mobility challenges or not own a car, limiting their ability to reach healthcare, jobs, or other critical services. This may include tourists, who are less likely to have their personal vehicle with them and rely on local public transportation options. Residents in Columbus' Linden community, for example, live in a food desert, with above-average unemployment rates, and public health issues such as a high infant mortality rates. [2] During the COVID-19 pandemic, residents often lacked safe and reliable options to retrieve food, supplies, and other necessities.

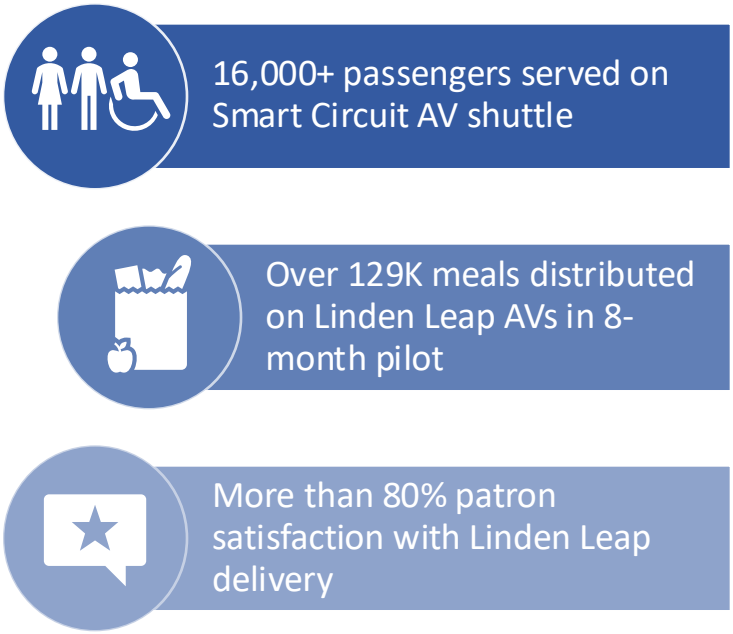
AVs have enormous potential to improve roadway safety and performance and contribute to more livable, vibrant, and equitable communities by providing more affordable mobility options and improving transit access. AVs can provide mobility options for people with disabilities and seniors, as well as access for underserved communities. They can complete last-mile deliveries more efficiently than traditional vehicles, and since they are often electric, with less tailpipe emissions as well. Columbus demonstrated that by deploying AV technology and being a leader in this space, these transportation challenges can be mitigated and overcome.

Technology Solution

As part of the Smart Columbus Program, two Connected Electric Automated Vehicle (CEAV) deployments of shuttles equipped with a suite of LiDAR sensors, 360-degree cameras, and GPS to achieve SAE J3016 Level 5 (Full Driving Automation) were demonstrated. The goal of the pilot was to aid travelers by improving access to downtown attractions and to provide better connection between existing transit routes and jobs and businesses.

The first CEAV deployment (Smart Circuit) was located along the Scioto Mile in downtown Columbus which served various attractions and cultural resources. The second CEAV deployment (Linden Leap) served first and last mile connection to transit in Linden, Columbus. During these pilot programs, trip data was collected to monitor performance, speed, autonomy, and safety of the AVs.

Outcomes & Benefits



With over 16,000 passengers served by the Smart Circuit shuttle, more Columbus residents and visitors were connected to downtown and other important cultural resources. As the state's first AV deployment on public streets, Smart Circuit was a great teaching tool for technologists, residents, and policymakers on the benefits of automated transportation technologies. Additionally, this pilot lays the groundwork for more mobility pilots to help increase access to transportation for those in need of critical healthcare.

The Linden Leap service launched in February 2020 and operated for two weeks, with 50 passenger rides. At the onset of the pandemic, the Linden Leap transformed its mission to be a food pantry delivery service, delivering food boxes from St. Stephen to Rosewind, a large public housing development.

During the demonstration period from July 2020 to April 2021, the shuttle service delivered 100 boxes of food per week, totaling over 129,000 meals for residents. This CAEV-enabled food delivery eliminated the two-mile walk to and from the pantry, providing relief to those who do not drive and/or have mobility issues, as well as limiting potential COVID-19 exposure. These AV deployments brought benefits to the Columbus community far beyond transportation efficiency, improving the health and well-being of residents and visitors.

Conclusion

Deploying AVs in urban areas helps connect people to critical resources and infrastructure, like jobs, groceries, social services, and healthcare. Columbus' pilot of CEAVs demonstrated how automated vehicles can efficiently transport food and other goods to those in need, while supporting transportation needs for the rest of the community and visitors. By serving cultural resources and other attractions, AVs and other public transit options can boost economic activity in a region, making areas more accessible for those without personal cars or those with mobility challenges. ITS America supports the safe deployment of AVs to create more equitable communities, help those with mobility challenges, and improve the safety and efficiency of our roads.

Participants involved in this use case include the City of Columbus, Ohio.

Sources:
[1] Columbus Dispatch
[2] State Scoop

Automated Transportation for Medical Supplies

Jacksonville, Florida

Transformative mobility solutions like automated vehicles (AVs) not only move people from place to place, but also can move critical resources such as food and medical supplies. The COVID-19 pandemic impacted communities, disrupting transportation networks, health care systems, and everyday life. AV shuttles, like these in Florida, can help carry medical supplies to those most in need. Deploying AVs in health care settings can help keep the public safe and healthy, while ensuring efficient use of medical resources.

The Challenge

During the COVID-19 pandemic, communities faced unprecedented public health challenges, supply chain shortages, health care resource issues, and economic headwinds. The City of Jacksonville and the larger Duval County were no exception, with test positivity rates hitting as high as 19.1% in early July 2020, and average number of new cases per day often in the hundreds. [1] With testing demand surging nearly every day along with the number of cases, hospitals and laboratories faced worker shortages as their own staff became sick while taking care of patients or testing others. With resources low, hospitals and community organizations needed a way to conserve staff resources while also transporting critical medical supplies, including COVID-19 tests, to their proper destination.

Technology Solution

As movement in cities slowed down to the COVID-19 pandemic, the Jacksonville Transportation Authority (JTA) kept moving to support its residents. Through a unique partnership with the Mayo Clinic, the JTA transported COVID-19 samples on the medical facility's sprawling campus using the Ultimate Urban Circulator (U^2C), a Level 4 autonomous shuttle. The autonomous vehicles were fully operational during the pandemic and provided life-saving assistance to essential health care personnel. The JTA's partnerships with the Mayo Clinic, Beep, and NAVYA to use autonomous vehicles to transport COVID samples from a drive-thru testing location at the Mayo Clinic to a laboratory on the other end of the campus was a first in the nation. Five days a week from April through July 2020, the JTA's fleet of U^2C autonomous vehicles transported COVID-19 samples to the lab, freeing up the Mayo Clinic's essential health workers for more crucial tasks. In one week, the JTA's Technology and Innovation Division launched this program, something that would normally take one month to operationalize.

Using AVs, communities, hospitals, and governments have the potential to reshape the future of medical transportation and the movement of critical goods and services. AVs can complete last-mile deliveries more efficiently than traditional vehicles and play a critical role in keeping people healthy and safe. Driverless technologies enabled organizations to worry less about their workers getting sick during the pandemic, and they could focus more on keeping the public healthy and informed about the illness.

Outcomes & Benefits

AVs transported **30,000 samples**

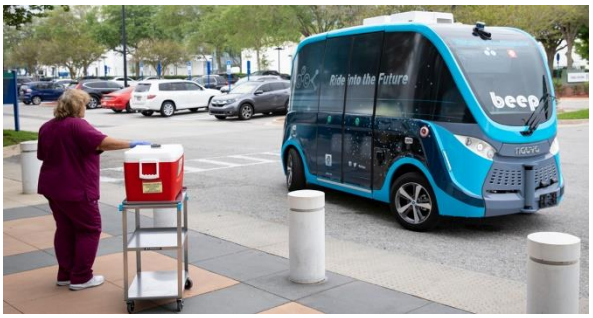
The shuttles made **227 runs** in four months

10,000 tests per month on average transported to laboratory

JTA's U²C program was reimagined for assisting the Mayo Clinic with critical COVID-19 testing operations, and the AV shuttles helped the hospital and city keep residents safe and informed about their health. Between April 1 and July 31, 2020, four driverless vehicles drove 200 miles and made 227 runs. In total these vehicles transported 30,000 samples, for an average of 10,000 tests per month. [2] With the help of the shuttles, the hospital was able to test thousands of people in the Jacksonville area, while also freeing up critical staff resources during a time where many faced illness and stressful situations. By reimagining the U²C program, JTA was able to assist during a time of need for the community. With driverless, electric shuttles, the program could transport COVID-19 test samples to the associated laboratory quickly and safely, without needing to use precious staff time. [3]

Conclusion

Innovative mobility solutions for business, healthcare, and other critical community functions can improve health outcomes for people and enhance quality of life. Beyond the traditional transporting of people from place to place, Jacksonville's U²C program during the COVID-19 pandemic is strong example of how AVs have many uses. ITS America supports the continued deployment of AVs in creative ways that strengthen communities, make health care operations more efficient, and keep people healthy and safe.



Participants involved in this use case include the Jacksonville Transportation Authority, Beep, NAVYA, and the Mayo Clinic.

Sources:
[1] New York Times
[2] Jacksonville Transportation Authority
[3] Navya

Providing First and Last-Mile Mobility with AVs

Cary, North Carolina

Efficient transportation services may not be equally available across the country, with smaller, less dense communities often in need of improved transportation options for those with mobility challenges. Efficient transportation solutions such as automated vehicles (AVs) are able to bridge this mobility gap, providing transportation options to those who may not have a car or are unable to walk. By using AV shuttles as a mobility-on-demand option, we can improve well-being, economic opportunity, and build more vibrant communities.

The Challenge

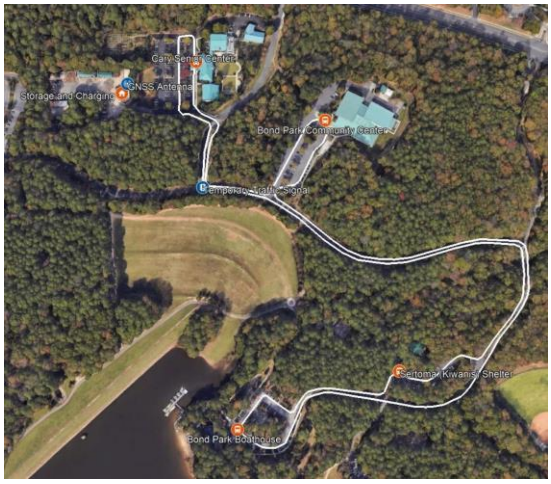
Accessing public lands, including parks and other nature areas, can be difficult for those without reliable access to transportation. With many recreation areas only accessible via private car, those who do not own one or cannot drive one may be left without an option to get around easily.

Additionally, the elderly face mobility challenges at higher rates, and may not be able to access public parks and entertainment on foot or with reliable transportation. **According to the U.S. Census, 36% of seniors had at least one disability, with 2/3 of them having difficulty walking.** [1] By providing shuttle services in recreation areas with stops at community and senior centers, communities can improve the quality of life for seniors and provide them with affordable and reliable mobility options.

AV technologies are increasingly capable of helping people access transportation options for grocery trips, medical appointments, jobs, social services, and more. AV shuttles can break down mobility barriers, bringing people to recreation, entertainment, and outdoor areas, all while increasing community ties and quality of life in a city.

Technology Solution

The North Carolina Department of Transportation (NCDOT) partnered with the city of Cary, NC and Beep, Inc. to bring a novel-design, all-electric, low-speed automated shuttle to Fred G. Bond Metro Park in Cary for a 13-week pilot through the Connected Autonomous Shuttle Supporting Innovation (CASSI) program. Beep operated a Navya Autonom shuttle on a 1.6-mile, four-stop route within the park that connected the Cary Senior Center, a large park shelter and aMPHitheater, a lakeside boathouse, and a community center. The shuttle was free and open to the public on weekdays from 10:00 a.m. to 4:00 p.m. during the pilot period. The pilot was the first under NCDOT's CASSI program to include Vehicle-to-Infrastructure (V2I) communications between the shuttle and a traffic signal on the shuttle's route. The Navya Autonom shuttle has 11 seats, and the shuttle includes a manual ramp to ensure access for riders using mobility devices. Each shuttle had an attendant present during automated operation.



Outcomes & Benefits

During the deployment, NCDOT collected data on ridership and provided riders with the opportunity to take a survey about their experience. Feedback from the rider survey indicated that most riders (92% of respondents) had a good experience using the shuttle. According to the survey, over 80% would ride the shuttle again, and most users got on and off at the senior center stop, illustrating how seniors and those who lack mobility options may have benefitted the greatest from the shuttle. With over 1,700 riders served on 494 trips, the automated shuttle provided first and last mile mobility to park-goers of all kinds, helping them reach different points and recreation spots more easily. After riding, riders indicated that they felt a higher degree of safety than they initially thought, and 88% said they supported more autonomous vehicle shuttles in Cary in the future. [2] Riders even indicated that some personal vehicle trips were replaced by the shuttle, and they were able to access new areas of the park than they had before.

Photo courtesy of North Carolina DOT.

1,718 Riders

494 Trips

92% good experience

Conclusion

By using AV shuttles in public parks and community hubs, cities and transportation agencies can bring people together and improve access to recreation for residents and visitors. By strategically locating a stop near the senior center, the CASSI program has been able to help seniors with first and last mile mobility to the surrounding park and entertainment options. Access to recreation and entertainment is vital to the well-being of residents and strong ties within the community of Cary. ITS America supports the continued deployment of AVs to create more equitable communities, help those with mobility challenges reach their destinations, and make our roads safer and more efficient.

Participants involved in this use case include the North Carolina Department of Transportation, City of Cary, NC, and Beep.

Sources:
[1] U.S. Census Bureau
[2] NCDOT

Piloting Shared AVs for Future Transportation Needs

Contra Costa County, California

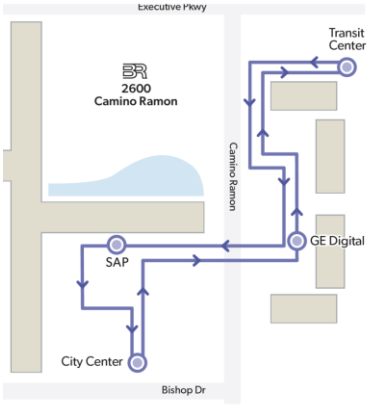
Providing efficient, last-mile mobility can be a challenge for cities and counties across the country, but by using shared automated vehicles (AVs) to expand transit options and connect people to commerce, local agencies can improve transportation networks and provide environmentally friendly, cost-effective transportation. Shared AV shuttle pilots can provide the foundations for greater mobility in a variety of areas, particularly urban ones, and are on the cutting edge of transportation technology that will improve efficiency and safety on roads.

The Challenge

Contra Costa County has a population of over 1.1 million residents in 19 cities and is located east of the San Francisco Bay. The county has an extensive transportation network, including major freeways, regional rail service, and various bus operations. Due to its strategic location, the county has experienced significant growth, resulting in a noticeable degradation in travel times, incidents, and transit service reliability. While transit options exist, reliable first and last mile connections to existing transit services and commercial centers are needed to better serve local communities and encourage mode shift away from single occupant vehicles. Shared autonomous vehicles (SAV) have the potential to address first mile and last mile challenges, while also helping to improve transit services for all users in a safe, cost-effective, and environmentally friendly manner.

Technology Solution

In 2016, CCTA sponsored key legislation enabling the testing of SAVs and obtained permission from the National Highway Traffic Safety Administration (NHTSA) to import the EZ-10 SAV for initial testing. The project team began testing the SAV in 2017 at GoMentum Station and later moved the pilot deployment to the Bishop Ranch Business Park, in San Ramon, California, to conduct tests in a real-world environment. The vehicles were in operation from March 2017 to August 2019 and collected over 1500 miles of data during testing and operation at the Business Park. For the purposes of Phase 2 testing, vehicle speeds did not exceed 12 MPH. While operating under these speed conditions, the vehicle was fully capable of performing basic driving operations with active braking system specifications, localization and navigation on pre-programmed fixed deployed trajectories.



The SAV program was reorganized recently and introduced as part of CCTA's PRESTO program, a new suite of mobility options, including bike share, scooter share, and express bus service, in addition to autonomous shuttles. Additionally, the SAV program is working to improve connectivity of vehicles (C-V2X) through the pilot. Beep was hired to supply and operate the two Navya SAVs that are currently serving CCTA's federally funded Mobility On-Demand project. As part of the PRESTO program, CCTA is running low-speed, autonomous shuttles at Bishop Ranch. The PRESTO shuttle service was initiated in April 2023 and will run through December 2024, providing free service to four key destinations within the Business Park. The PRESTO shuttle service is the first open-to-the-public SAV project in the Bay Area, and part of a series of autonomous vehicle pilot projects that will lay the groundwork for improving mobility and transit options for all.

Outcomes & Benefits

The operational analysis and feedback from passengers and project partners led us to create new key performance indicators to ensure the SAV operation can meet the expected performance, align with project objectives, and monitor the metrics most important to project stakeholders. The AV shuttles at Bishop Ranch will pave the way for increased mobility in the Bay Area and improved efficiency in the transportation network. The automated shuttles will help provide first and last-mile mobility to users in the designated loop, while keeping users and pedestrians safe. Lessons learned from the demonstration will help guide the development of future SAV projects in Contra Costa County. New key performance indicators from the project include:

Service Reliability

Ability to adhere to the schedule and provide consistent service. It includes metrics such as headway, on-time, and on-schedule performance.

Safety and Security

Record of incidents or crashes related to the shuttle service, ensuring the safety of passengers, and maintaining a secure environment.

Utilization

Average occupancy during operating hours to help determine efficiency of service and ability to accommodate passenger demand.

Service Availability

Percentage of time the shuttle service is operational and available to passengers.

On-Time Performance

Percentage of trips that start and finish on schedule.

Customer Satisfaction

Feedback from passengers regarding their overall experience.

Energy Efficiency and Environmental Impact

Measurement of shuttle energy consumption and environmental impact.

Conclusion

This AV shuttle testing and pilot program, alongside a wider suite of micro-mobility and transit options, will help Contra Costa County and the California Bay Area improve its transportation network. By developing new key performance indicators as well, the PRESTO program will help improve operational efficiency and ensure even stronger transit offerings in the future. ITS America supports the continued deployment of AV shuttles like this one in San Ramon to make road travel more efficient, bridge first and last-mile mobility gaps, and ensure that transportation is evolving and improving to meet the needs of consumers and businesses.

Participants involved in this use case include the Contra Costa Transportation Authority, Beep, the City of San Ramon, CA, and Bishop Ranch Business Park.

Sources:
[1] Contra Costa Transportation Authority

Supporting CAV Deployments Through Smart Infrastructure

Central Ohio

Challenge

The I-70 Truck Automation Corridor project spans a 166-mile segment of Interstate 70 between Columbus, Ohio, and Indianapolis, Indiana. This corridor serves as the testing and deployment area for automated truck technologies. Many roads in the U.S., however, are not ready or properly equipped for connected and automated vehicle technologies. Infrastructure plays a large role in ensuring that automated systems can operate efficiently and safely. As part of the I-70 Automation Corridor initiative, DriveOhio and project partners developed an Automated Road Audit Tool to assess and monitor infrastructure readiness for automated vehicle (AV) operations.

The tool uses onboard sensors and analytics to detect infrastructure deficiencies—such as faded lane markings, signage issues, or pavement anomalies—that may affect AV performance. This innovative approach streamlines data collection and prioritizes infrastructure maintenance with AVs in mind.

The I-70 Truck Automation Corridor program truck automation deployments will serve as a model, using audits and outreach, to determine the readiness of other interstates in the two states for future deployments.

Technology Solution

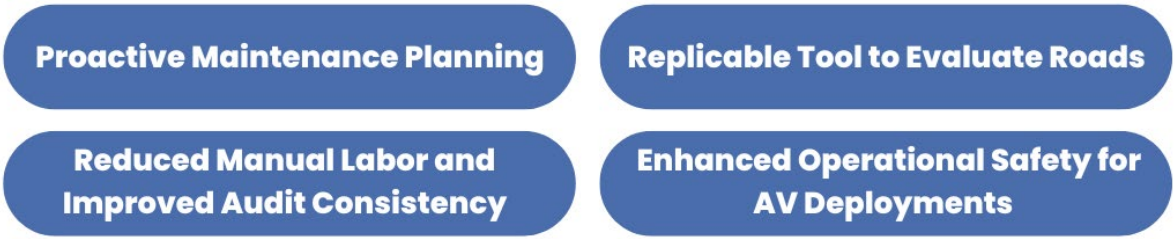
The Automated Vehicle (AV) Road Audit Tool is being used to identify deficiencies in lane lines and signage and to help Infrastructure Owner Operators (IOOs) prepare for vehicle automation and make data-driven decisions about roadway asset improvements. The road audit assessment and tool is being developed as part of a multi-agency FHWA grant.

The prediction hardware and software consist of vehicle mounted GPS, optical sensors, connection to vehicle ADS, and a robust ML-based processing algorithm.

The data ingestion, processing, and transformation pipeline incorporates an automatic sync function to transfer the sensor payload data from the in-vehicle data collection hardware to a cloud-based storage and compute environment, simplifying the process of transferring the GB and TB scale data collections. The output of the data processing is immediately available through a web-based road audit tool for visualization and analysis. The AV Road Audit tool will be made available as an open-source solution for transportation agencies to deploy and use freely.

Outcomes & Benefits

The anticipated outcomes include:



Conclusion

As the U.S. moves closer to a future with widespread automated vehicles and freight, our nation's roadway infrastructure needs to be prepared. Using advanced technology and data collection methods, states, like Ohio, can prepare its infrastructure to meet the needs of future mobility methods, such as ensuring the efficient and safe operation of AVs on public roads.

Participants in this use case include DriveOhio and HNTB.

Sources:
[1] HNTB

The Intelligent Transportation Society of America
1100 New Jersey Ave SE, Suite 850
Washington, D.C. 20003