ITS AMERICA

ITS Technology Use Case Library

Volume 3

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

June 2025

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ITS AMERICA

Using Radar Detection for Intersection Safety

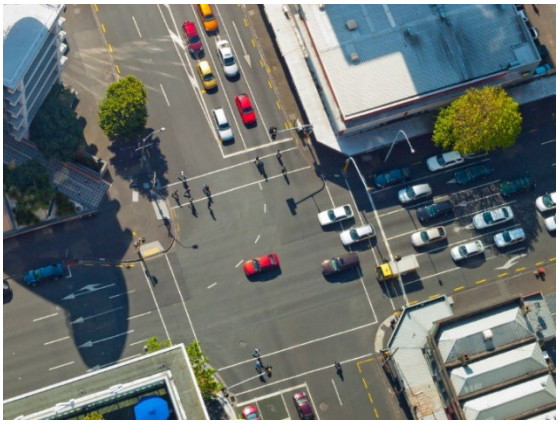
Central Ohio

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areas of Ohio along SR 16, “Prepare to Stop When Flashing” signs were reaching the end of their lifespan and becoming outdated by new technological capabilities.

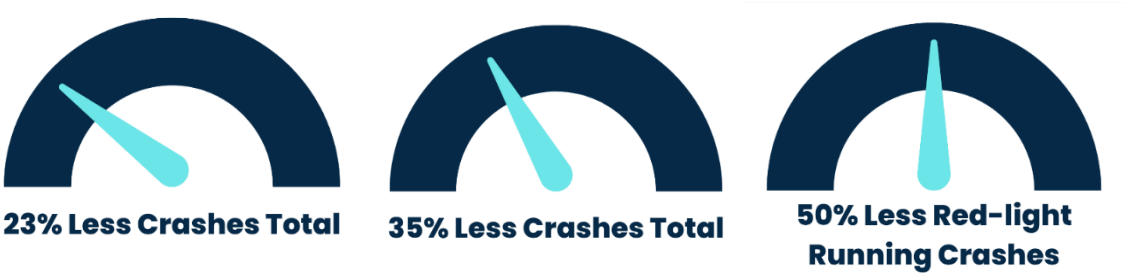


The Ohio Department of Transportation took action to help prevent more crashes and injuries at these intersections by deploying radar-based detection systems that would more closely monitor vehicle speed and adjust traffic signals accordingly.

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

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.

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.

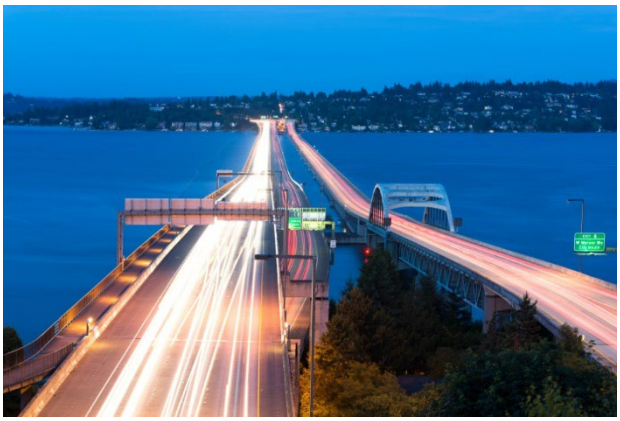
Sources:
[1] Miovision

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

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.

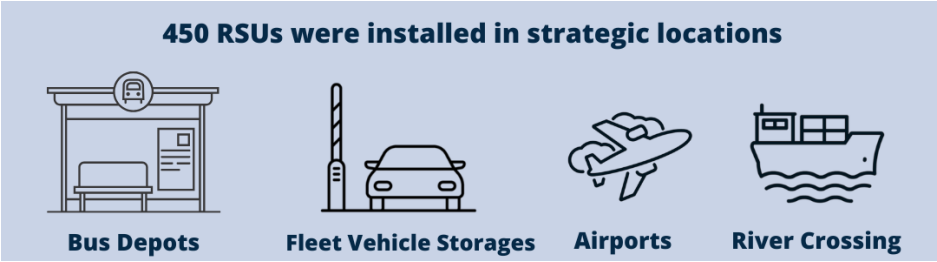
As part of the pilot project, NYCDOT encountered challenges related to government procurement processes, quantity of roadside units (RSUs) needed, and fleet management.

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

Inspecting Infrastructure with UAS

Michigan

Challenge

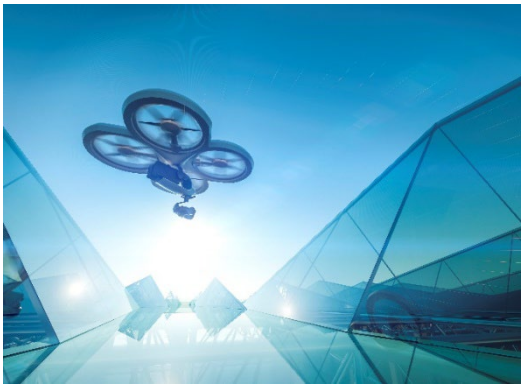
The Michigan Department of Transportation's (MDOT) Ancillary Structures (AS) Program is a first-of-its-kind program performing comprehensive asset management providing real time data regarding ancillary structure inventory and inspection. The program began in 2020 and provides MDOT Region Staff ancillary 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

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

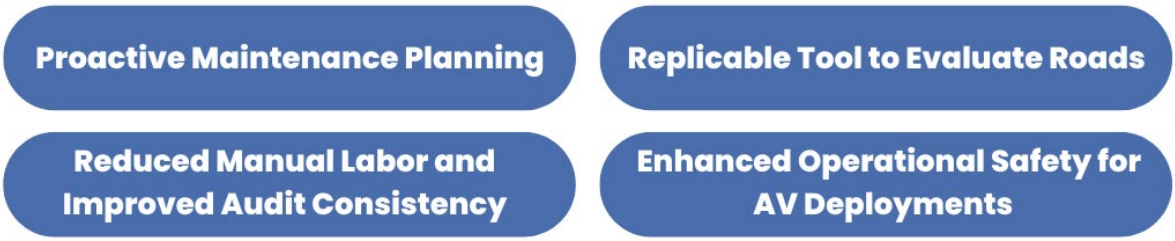
The Automated Vehicle (AV) Road Audit Tool is being used to identify deficiencies in lane lines and signage and to help Infrastructure Owner Operators (IOOs) prepare for vehicle automation and make data-driven decisions about roadway asset improvements. The road audit assessment and tool is being developed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

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

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

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