Company Name: Nashville Department of Transportation and Multimodal Infrastructure (NDOT)
Project Title: Leveraging Advanced Data to Deliver Multimodal Safety (LADDMS)

Project Description:

2024 was a banner year for the Nashville Department of Transportation ITS division as the department launched a new traffic management center, saw the city pass a $3.1B transit referendum that includes dedicated funding for 592 smart signals and communication upgrades, and delivered on its SMART Grant Stage 1 LADDMS project while also receiving a $10M SMART Grant Stage 2 award to expand the work. Established only a few years ago in 2021, NDOT has quickly become a leader among local governments in ITS and innovation thanks to a leadership structure that embraces the growing role of technology in solving transportation issues.

Mayor Freddie O'Connell, elected in 2023, holds a bachelor's degree in computer science and spent his professional career in software and technology. He has positioned himself as Nashville's transportation champion, securing $200M in smart infrastructure funding through the Choose How You Move Transit Referendum and sharing his vision for the city with partners at USDOT and NSF. NDOT Director Diana Alarcon was appointed to lead the department in 2022 following more than 30 years of private and public sector transportation experience. Her focus on modernizing Nashville's transportation network has led to technology transformations across all sectors from replacing existing coin operated parking meters with the latest smart parking technology to requiring standardized data sharing from third party multimodal transportation providers operating in the city to investing heavily in the cities fiber communication network. NDOT Deputy Director Brad Freeze joined the department in late 2021 after serving nearly twenty years with the Tennessee Department of Transportation, most recently as Director of the Traffic Operations Division. Brad brings a wealth of experience in the ITS world including serving as the NOCoE technical advisory committee chair, initiating Tennessee's first integrated corridor management project, and building out the current NDOT ITS staff consisting of ITS professionals with experience from Washington DOT to the Vermont Agency of Transportation quickly infusing the team with decades of expertise.

The LADDMS project was initiated through NDOT's Vision Zero Action Plan which called for exploring ways to collect data on near misses and unreported traffic related injuries, a key to proactively addressing safety issues before they result in crashes, serious injuries, and fatalities. NDOT recruited a project team of academics, consultants, and contracting partners to apply for the USDOT's first round of SMART Grant awards aimed at advancing smart community technologies and systems to improve transportation efficiency and safety.

The resulting LADDMS project captured location and trajectory data on a multimodal level using LiDAR sensing which is critical to transportation safety on urban street networks. The interactions between vulnerable road users – pedestrians, cyclists, transit users – and surrounding vehicles impact comfort and safety and the risk of injuries resulting from crashes. LiDAR provides high-resolution data for the multimodal traffic context and safety analytics that cities need to make roads safer for all users. Following the first installation in Spring 2024, the LADDMS project team has used LiDAR in various forms and factors to rapidly collect multimodal data, deploy interventions to address safety issues, and evaluate the impact of new interventions. Fixed sensors at intersections or midblock locations are installed and configured in less than a day. The team has also deployed a mobile LiDAR trailer that can be relocated and set up in less than an hour. Sensors and their edge processors immediately begin streaming anonymized locations of every object in view, which are used to compute near misses, speeds, turning and crossing movements, out-of-crosswalk activity, and more.

Two cases exemplify the capabilities and speed of evaluation enabled by the technology:
(1) Crosswalk usage

- Building design and signal timing at a Clarksville Pike intersection was prompting frequent out-of-crosswalk events by pedestrians resulting in 10+ near-misses daily.
- Installation of a Pedestrian Hybrid Beacon and more responsive pedestrian actuation at signals reduced out-of-crosswalk use in the target zone by 80%.
- Full study turnaround time: 5 days

(2) Vehicle speeding

- Vehicles traveling 20+mph over the speed limit (a.k.a., “super-speeders”) were cut by
- 30% following the deployment of radar speed trailers.
- Total turnaround time to evaluation: 4 days.

In addition to technological capabilities, the selection of LiDAR for the LADDMS project was partly driven by community desires for privacy preserving technologies. Interviews and engagement revealed otherwise strong interest in the mission of proactively identifying and addressing safety within the North Nashville area along Clarksville Pike. The below links provide an overview of community outreach along with a real time viewer:

- North Nashville Community Engagement
- Nashville Real Time Viewer

The success of the LADDMS projects led to Nashville receiving a $10M SMART Grant Stage 2 award to expand the deployment and use of LiDAR technology to include identifying ten other DOTs across the country to provide full installation and training ensuring the technology not only benefits Nashville but cities across the US.