MNDOT CONNECTED CORRIDOR PROJECT

Overview and Objectives

The Connected Corridor project was a three-year project to help the Minnesota Department of Transportation (MnDOT) advance the future of transportation. The project included the planning, design, deployment, and operation of connected vehicle (CV) technologies – including software systems and infrastructure – to understand how to plan and prepare for emerging transportation technologies. This project included vehicle-to-infrastructure (V2I) technology, which helps vehicles “talk” to infrastructure to improve safety and efficiency of roadway users.

MnDOT initially selected the Highway -55 corridor between downtown Minneapolis and Interstate 494 to pilot this technology. The objective of this “Connected Corridor” project is to broadcast signal, phase and timing (SPaT) information to vehicles directly from traffic signal controllers on the corridor to vehicles that are connected with this technology. SPaT data can support many different applications that advance national connected vehicle deployment. This technology and information can also help MnDOT build the communications infrastructure and data management systems to support existing and future technologies. This initial deployment included equipping MnDOT fleet vehicles to demonstrate the capabilities of the technology.

Project Overview

To develop and successfully implement the Connected Corridor, MnDOT adopted an innovative hybrid delivery approach; the project was planned, designed and deployed by a strong coalition of public and private partners, including consultants, vendors and staff from MnDOT and the Minnesota Department of Information Technology (MnIT). The project partners provided equipment, software development support, and technical integration services, with the goal to build relationships with Minnesota-based partners to grow Connected and Automated Vehicles (CAV) business and technical expertise and prepare Minnesota for future technologies.

This public-private partnership allowed the project team to remain flexible and nimble in a fast-changing technology environment, real-time information sharing and collaboration, and supported significant opportunities for hands-on learning and training for state employees.
Project Timeline and Milestones

**MNDOT ACTIONS**

- **August:** MNDOT Connected Corridor project kick-off, begin planning and scoping
- **April:** Infrastructure design and deployment phase commences
- **September-December:** Infrastructure, including traffic signal controllers, installed
- **Early January:** Successful initial testing of SPaT broadcast
- **April:** Application deployment phase commences. MNDOT reduces the testing scope to focus on Snow Plow Signal Priority (SPSP)
- **Fall:** Progress on SPSP application stalls as industry uncertainty erodes vendor development and support efforts
- **January:** MNDOT reevaluates objectives in light of industry changes and signal controller development setbacks, scaling back application development
- **May:** Upgraded traffic signal controller deployment to support signal priority pilot
- **August 2020:** Signal priority pilot completed

**INDUSTRY ACTIVITIES**

- **2017:**
  - Dedicated Short-Range Communications (DSRC) still predominant technology in CV discussion, with automakers working to generate momentum where the government did not
  - AASHTO continues advancing SPaT Challenge (deployment at 20 intersections in all 50 states by 2020) to accelerate CV deployment in states

- **2018:**
  - On-Going: Continued lack of certainty on regulatory action helped to advance Cellular Vehicle-to-Everything (C-V2X) in discussion
  - The American Association of State Highway and Transportation Officials (AASHTO) and other automotive industry groups continued significant push for DSRC and to show deployment progress
    - **April:** Toyota announces intent to deploy DSRC in new vehicles starting in 2021
    - **June:** GM announces intent to expand their DSRC rollout beyond the Cadillac CTS

- **2019:**
  - C-V2X continues to undermine DSRC’s market position
    - **January:** Ford announces decision to back C-V2X
    - **April:** Toyota formally backs out of DSRC initiative
  - **May:** Upgraded traffic signal controller deployment to support signal priority pilot
  - **Fall:** Progress on SPSP application stalls as industry uncertainty erodes vendor development and support efforts

- **2020:**
  - **January:** MNDOT reevaluates objectives in light of industry changes and signal controller development setbacks, scaling back application development
  - **May:** Upgraded traffic signal controller deployment to support signal priority pilot
  - **August 2020:** Signal priority pilot completed
  - **December:** Federal Communications Commission announces rulemaking process to reallocate the 5.9 GHz spectrum largely for unlicensed WiFi and C-V2X communications
  - **Spring:** Alliance for Automotive Innovation announces commitment to deploy 5 million C-V2X units within 2 years in order to preserve 5.9 GHz spectrum for V2X use

Indicates major adjustment in project scope to respond to industry changes and conditions.
PROGRAM VALUE TO MNDOT

It remains unclear when connected vehicles will be deployed. The Connected Corridor program provided MNDOT with significant organizational benefits, including building its technical and institutional knowledge, identifying best practices and lessons learned, deploying new technologies, and building a system that is interoperable to plan for future technologies.

1. Established security and networking protocols for CV deployment: MNDOT strengthened critical relationships across state government and developed work products that are essential for long-term deployment far beyond the initial Connected Corridor.
   - Further a critical partnership between MNDOT and MnIT to support CV
   - Established security protocols
   - Developed network architecture
   - Procured security credentialing service critical to future deployment

2. Developed and deployed foundational infrastructure and systems: Most of the infrastructure investments for the Connected Corridor provide a foundation for future deployment activities statewide, and can be used regardless of technology changes.
   - Specific cabinet fiber and cabling changes
   - Signal controller upgrades and cabinet modifications
   - DSRC Roadside Unit (RSU) management system
   - CV data management system

3. Developed organizational capacity for future CV deployments: The innovative delivery model used by MNDOT ensured hands-on staff experience. This allowed staff to better understand what is required to deploy this technology and what skills are needed for future CV technologies.
   - Joint deployment approach ensured MNDOT staff capacity building (vs. traditional contractor deployment)
   - Signals and ITS staff learned the mechanics of the roadside unit (RSU)/controller programming and relationship for CV
   - Outreach efforts yielded greater understanding of internal and external partner needs and future opportunities to support them using CV technology

4. Understanding of technology readiness: The Connected Corridor program provided MNDOT an opportunity to better understand the relative maturity of the technology (including both signal controllers and RSUs), to work through deployment challenges, and to build or strengthen vendor relationships – lessons that will be critical to the future of the department’s CV program.

5. Demonstrated value of investment in emerging technologies: The Connected Corridor program highlighted the critical role that emerging mobility technologies will play for MNDOT, and emphasized the need for flexibility and adaptability in embracing them.