PROJECT SUMMARY

Rochester Automated Shuttle Pilot: *Med City Mover*

Project Location:

Rochester, MN

Start – Finish Date:

February 2021 – February 2023

Project Status:

Complete

Project Partners:

City of Rochester Public Works
AECOM
Kimley-Horn
First Transit
EasyMile

MnDOT Project Cost:

$370,000

Projects with Similar Characteristics:

Autonomous Bus Pilot
Bear Tracks AV Shuttle
goMARTI
Assessment of Ped Safety and Driver Behavior

Project Description:

The Rochester Automated Shuttle Pilot was a research project that included the 12-month demonstration (August 2021 - August 2022) of two highly automated and electric vehicles to over 3,000 passengers along a fixed route downtown in the City of Rochester. The circular, fixed route connected the Mayo Clinic downtown campus with residential neighborhoods, shops, restaurants, grocery stores, hotels, and parking lots to serve the residents and visitors of Rochester.

Each shuttle had a 6-person capacity with operating speeds of 12-15 mph.

Project Objective:

The project objective was to continue building statewide knowledge related to connected and autonomous vehicles (CAV) as well as continue building lessons learned about CAV operations on public roadways.

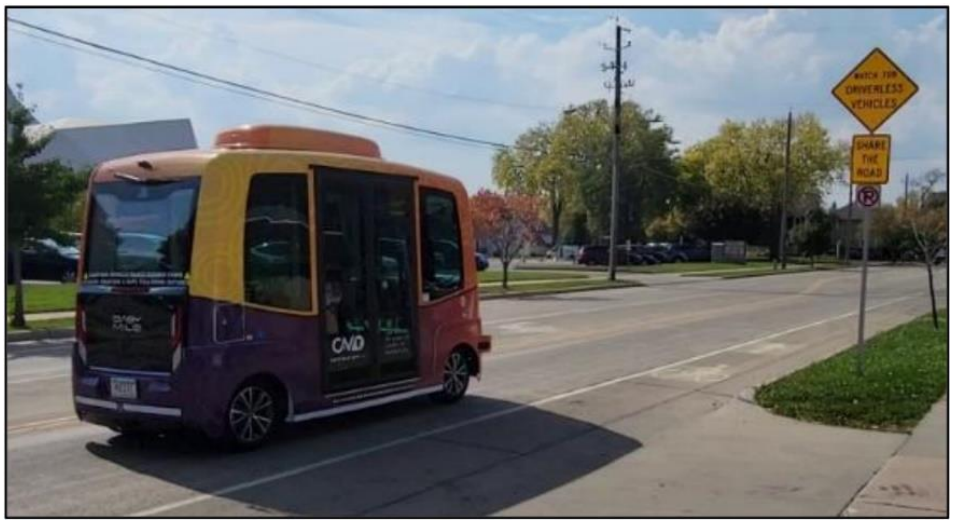

Figure 1: Med City Mover En Route

Project Accomplishments:

- Gaining a greater understanding of how to prepare for CAV technology implementation.
- Building public knowledge and understanding of CAVs.
- Documenting many lessons learned about the shuttle operations on a public roadway.

Key Findings:

GPS Signal Strength and Communications

Initially, the vehicle ran into an issue where it lost GPS signal and became uncertain of its location, which led to emergency stops or slowdowns. The issue was resolved by upgrading the vehicle sensor to improve the ability to maintain GPS signal. Additionally, communications issues between the vehicle on-board units and roadside units inhibited the automated operation of the shuttle through traffic signals at times when signal connectivity was down. Communication issues were eventually resolved by the project team and equipment vendors.

Construction Projects

If unplanned construction projects occurred along the pre-set shuttle route, coordination with multiple contractors needed to occur to continue shuttle operations. In some cases, the construction required the shuttle to be driven manually to navigate around construction barriers. For some long-term projects, the shuttle route was re-mapped as needed through or around the construction zone.

Driver Behavior Around Shuttle

Shuttle operators observed aggressive and unlawful driving behaviors around the shuttle, which included driving too close or too fast. Sometimes the aggressive driving even posed a threat to pedestrians in nearby crosswalks. To combat this behavior, the project team installed warning lights on the rear of the shuttle, released media campaigns to inform the public of the risks, and worked with local law enforcement to reinforce safe driving techniques.

Winter Weather

Of 14 days where the operational shuttle encountered snow conditions, only one day had operational impacts.

Lessons Learned:

- Connectivity tests, such as radio frequency studies and GPS/cellular signal studies, should be completed to design and procure communications equipment in the most optimal manner.
- Issue response protocols should be created for every project to describe how issues with equipment should be reported to the agency responsible for troubleshooting and repairs.
- An emergency communications plan and procedures document should be created to outline steps and procedures to follow in the event of an incident or emergency along the vehicle route.
- Prior to operations, data sources should be identified to support the evaluation of the project operations.
- Dashboards were a very useful tool when it came to analyzing key performance indicator results.
- Frequent coordination regarding short-term and long-term construction projects along automated vehicle transit routes is important.

Potential Next Steps for MnDOT:

- Develop defined and deliberate planning and design steps (Systems Engineering) when deploying projects requring V2I connectivity.
- Develop an automated vehicle “playbook” conslidating lessons learned, procedures and considerations based on MnDOT’s deployment experience.