Introduction

The Michigan Department of Transportation (MDOT) is assembling a technical demonstration for the ITS America 2026 annual show in Detroit. The theme of MDOT's demo will be *Everyday Interoperability*, showcasing how everyday people will benefit from a seamless ecosystem of emerging technologies, agnostic to details like delivery mediums and service platforms.

V2X and ITS technology have advanced beyond the limitations of traditional systems—advanced sensors, edge processing, and connectivity mediums continue to evolve every day, blending functions together and providing a "Swiss cheese" family of solutions that, when stacked together correctly, maximize each other's strengths and compensate for each other's weaknesses. MDOT intends for their demonstration to highlight the ways these solutions can be deployed together into a cohesive ecosystem.

To this end, MDOT has assembled a high-level design and requirements list for the demonstration system and is seeking participation from interested vendors whose solutions can enable the vision being put forward by the Department.

Opportunity Description

Michigan is home to a unique blend of public agencies, academic institutions, and private industries that make us the Automobile Capitol of the world. MDOT believes that through collaboration between these groups, interoperable deployment is achievable *today*—that the technologies available at this moment are capable of delivering real improvement to safety and mobility for American motorists and other road users.

This demonstration is therefore an opportunity for these organizations and businesses to prove that Michigan continues to lead the pack in transportation innovation by showcasing their equipment, software, and infrastructure capabilities.

High-Level Design

Thematically, MDOT intends to provide more of an *experience* for show attendees than a highly technical demonstration. The focus of the system is an output of cohesive, consistent information, regardless of its source or delivery medium. To include a maximum number of use cases, MDOT has divided their demo concept into three domains:

1. The I-94 Freeway Experience

2. The M-1 Intelligent Woodward Experience
3. The Everyday Downtown Experience

Each domain is intended to highlight a specific set of applications but provide a consistent experience across each of them; to drive home the "everyday" element of the demonstration, show attendees will experience the demonstrated applications while being driven to/from other tech tours for the conference or to ITSA sponsored hotels instead of only using the traditional demo scheduling approach.

MDOT's goal for implementation is to leverage existing assets wherever possible, but **enhance** them by integrating newer solutions that connect traditional ITS and V2X systems with emerging solutions.

The I-94 Freeway Experience

I-94 Freeway Experience will encompass the stretch of I-94 between Detroit and Ann Arbor. On this route are several existing systems that MDOT will leverage for the demonstration:

- Many existing fiber-connected traditional ITS installations
- The Cavnue 3-mile intelligent sensing V2X pilot (orange segment below)
- Portable work zone trailers equipped with video sensing, edge processing, and RSUs
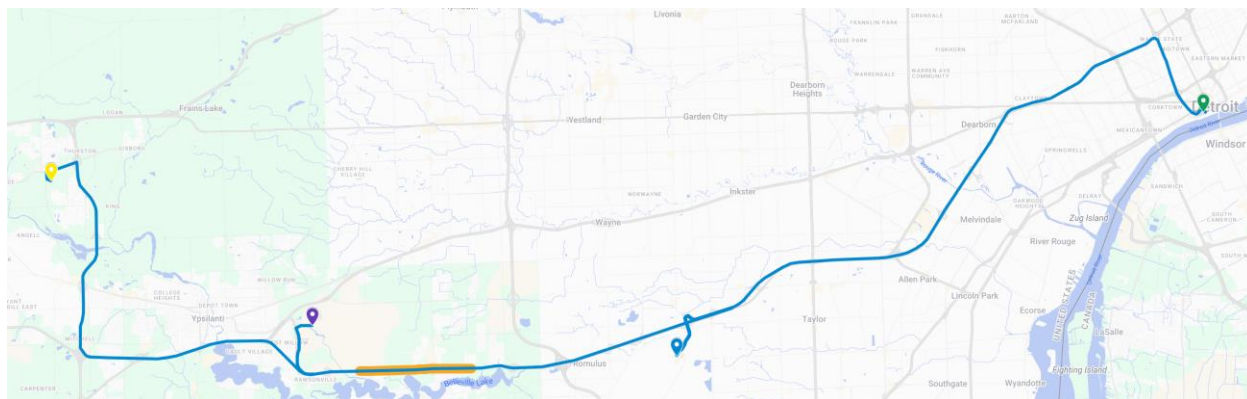
Figure 1 - The I-94 Freeway Experience Route

This 45-mile route will be traveled between the Huntington Place (green pin) and three primary destination locations:

- The University of Michigan Transportation Research Institute (UMTRI) Tech Tour in Ann Arbor (yellow pin)
- The American Center for Mobility (ACM) Tech Tour in Ypsilanti (purple pin)
- The Detroit-Wayne Metropolitan Airport (DTW) (blue pin)

This approach allows MDOT to present their demonstrated applications at least six times: to and from each tech tour, plus on shuttle trips to the airport before and after the show.

Applications

The I-94 Freeway Experience will feature applications more appliable to freeway use cases for V2X: work zones, road hazards (such as debris, or incidents), and emergency vehicles.

As shown in the diagram below, these applications will be driven by different technologies working in tandem together:

- Advanced roadside sensing
- 5.9 GHz RSUs
- MEC-based V2N (cell carrier "virtual RSUs")
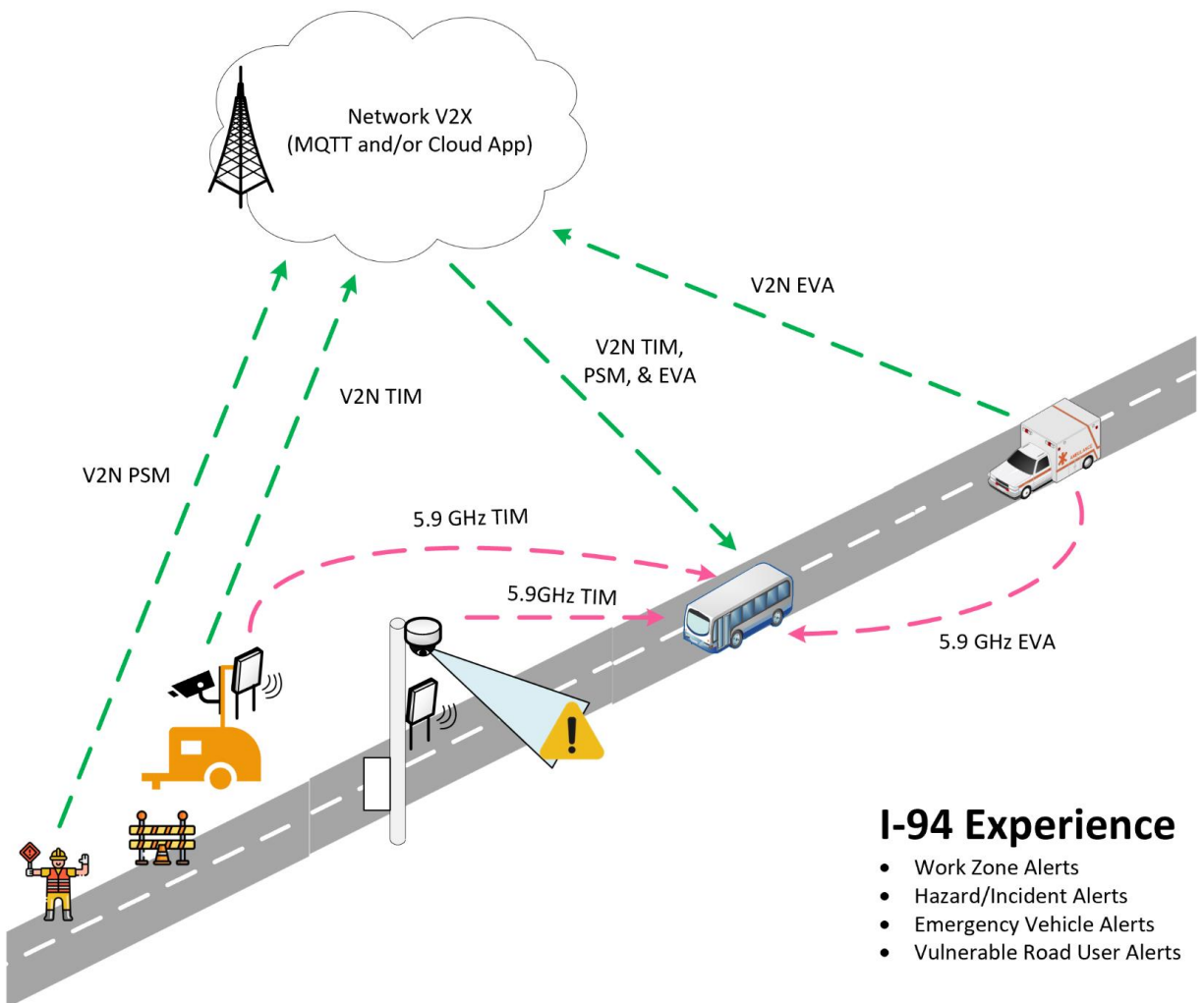- Cloud-based V2N (purpose-built cloud applications)

Figure 2 - The I-94 Freeway Experience Applications

The primary enhancements over the existing system will include:

- Widening the broadcast range of 5.9 GHz beyond the Cavnue pilot segment
- Bridging 5.9 GHz and V2N to deliver J2735 messages (or other alert formats) through both mediums

MDOT intends to utilize human-operated shuttle buses for the I-94 demonstration.

The M-1 Intelligent Woodward Experience

The M-1 Intelligent Woodward Experience will feature the technology being deployed under MDOT's ATCMTD grant project at 31 intersections between Downtown Detroit and W Grand Boulevard. These intersections already include:

- Cellular internet connectivity
- SPaT-compatible signal controllers
- Advanced video sensors
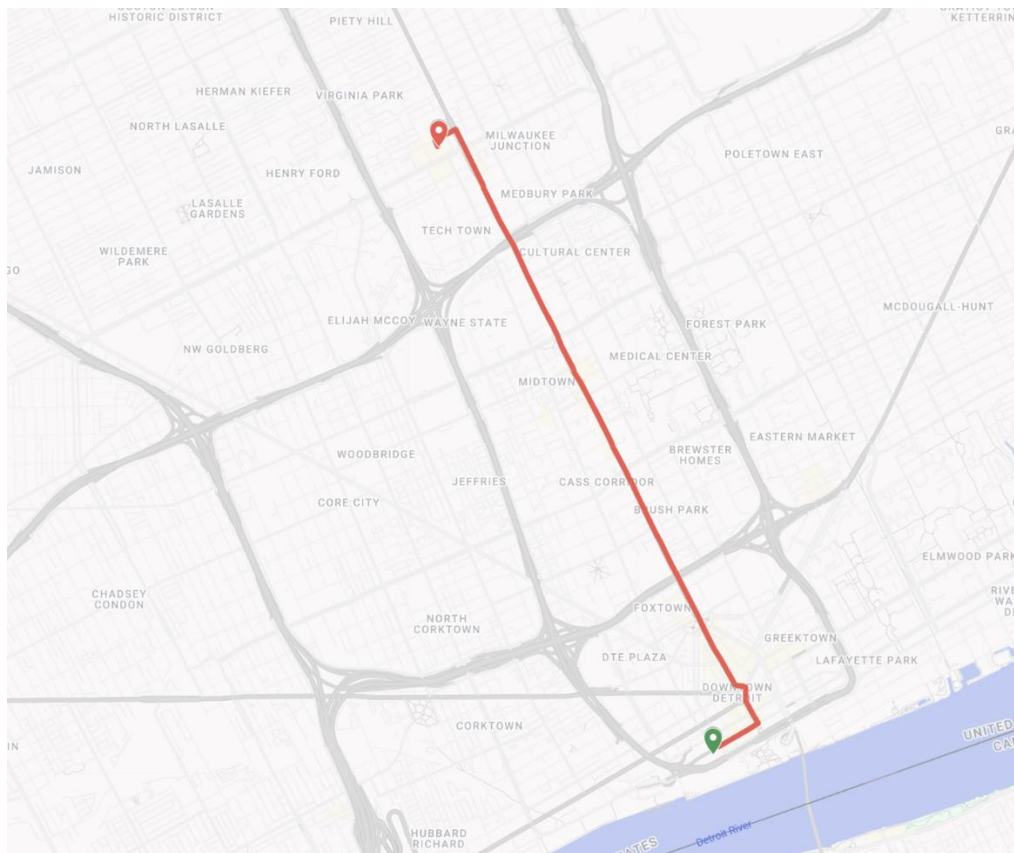- 5.9 GHz RSUs
- Edge compute platforms

Figure 3 - The M-1 Intelligent Woodward Experience Route

This 4-mile route will run between the Huntington Place (green pin) and the Electreon Inductive Charging Tour (red pin) at the Henry Ford Health center on Woodward.

Applications

Applications run on M-1 will focus on intersection-based mobility and safety services:
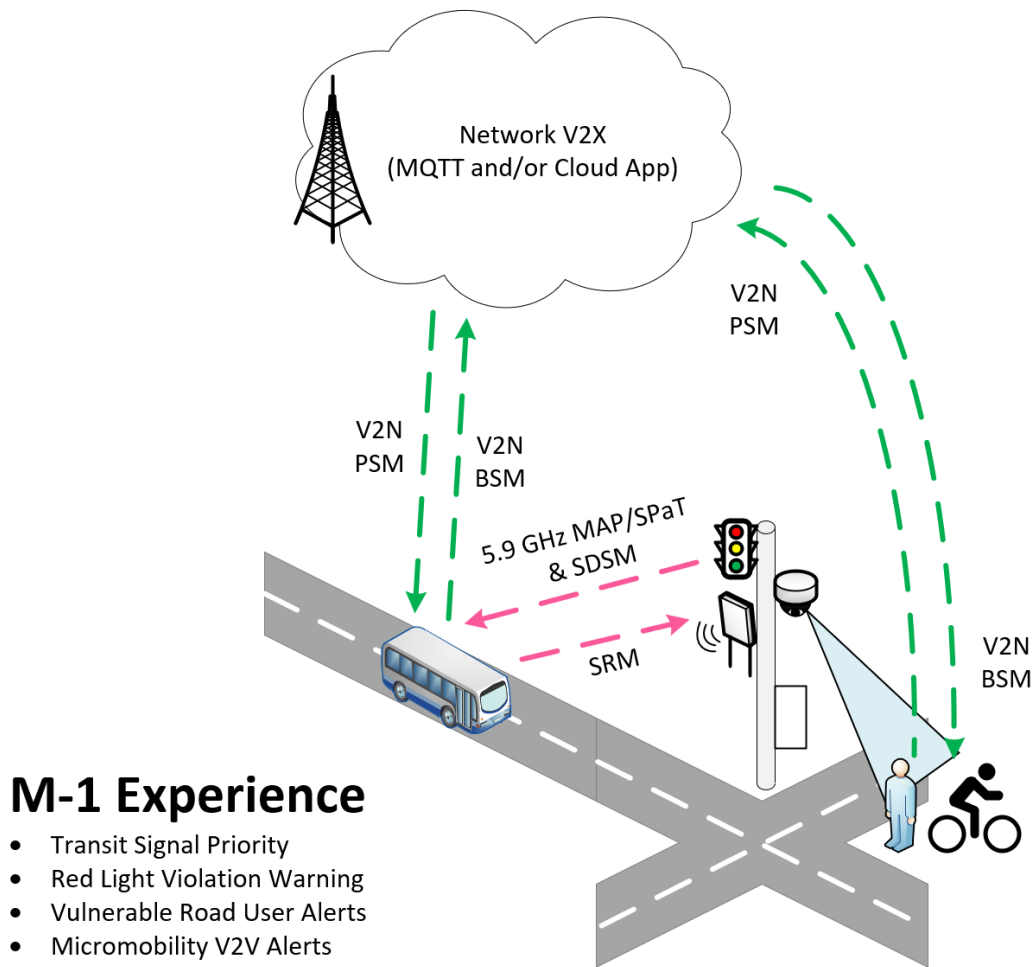

Figure 4 - The M-1 Intelligent Woodward Experience Applications

The primary enhancements over the existing system will include:

- Bridging 5.9 GHz and V2N to deliver J2735 messages (or other alert formats) through both mediums
- Incorporation of smartphone-based and Ultralight OBU applications to deliver V2N PSMs from pedestrians to the demo vehicle and deliver V2N BSMs from the demo vehicle to pedestrians and micromobility users

MDOT intends to leverage automated vehicle (AV) shuttle services for the M-1 demonstration.

The Everyday Downtown Experience

Limiting functions to only the two defined corridors of I-94 and M-1 doesn't communicate the "everyday" ethos of the demonstration that MDOT desired: therefore, they are seeking to implement V2N-only applications in the Downtown Detroit area to show how this technology can bring many benefits of V2X without requiring hardware deployment.
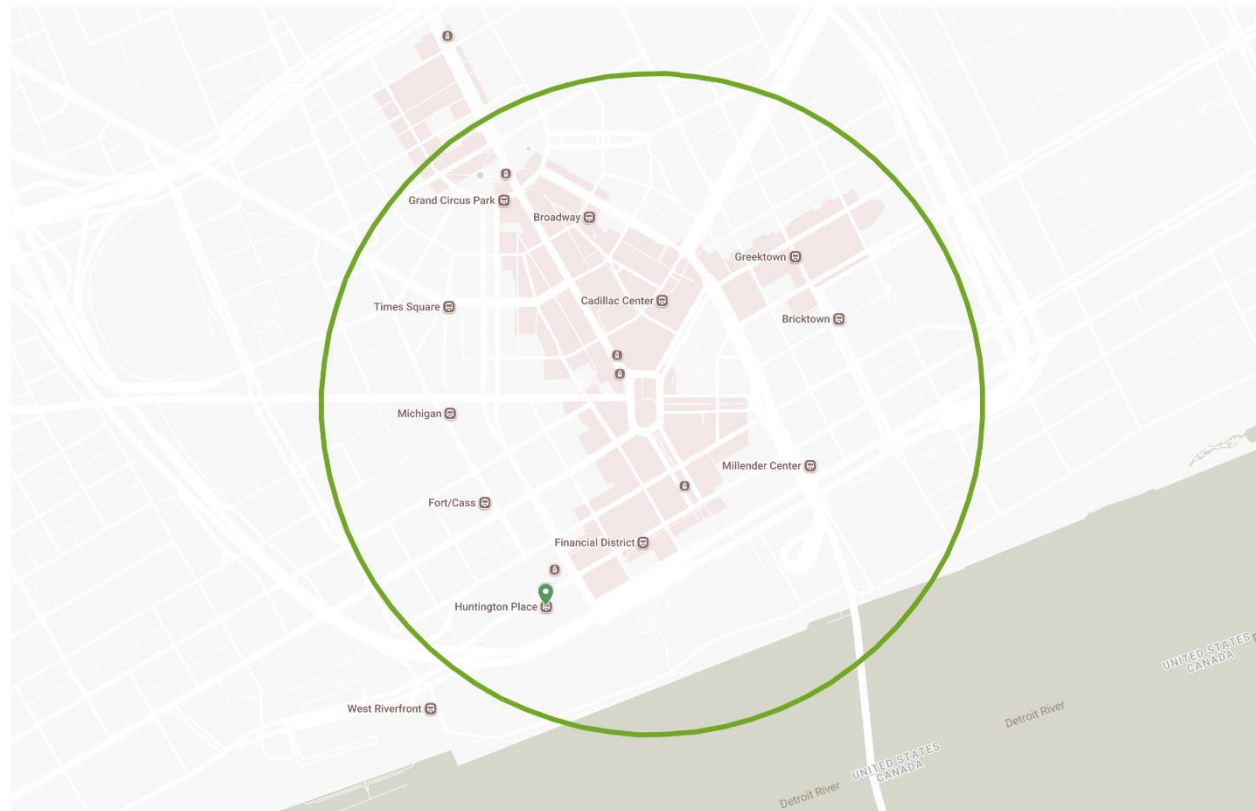
Figure 5 - The Everyday Downtown Experience Region

MDOT-provided AV shuttles (the same ones utilized for the M-1 demonstration) will switch from M-1 demo routes to another set of predefined routes between the Huntington Place conference center and ITSA-sponsored hotels. While the intended region for these applications is shown above using a green circle, there is not necessarily a limit to the parts of Downtown that they may operate in.
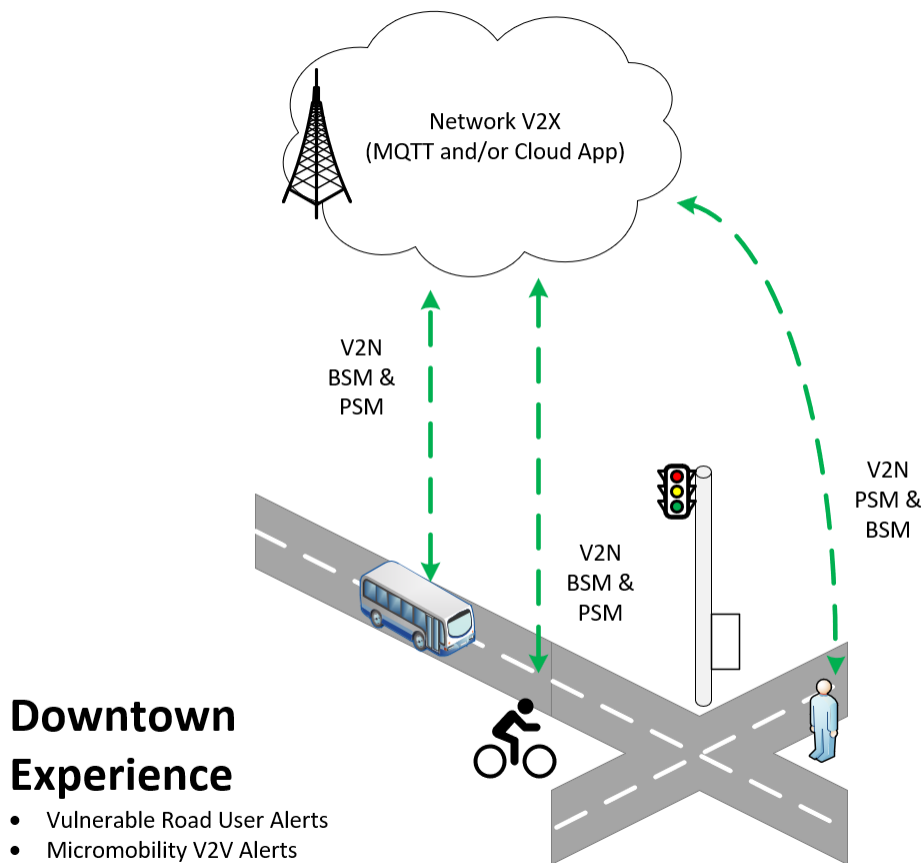
Applications

This domain of the demonstration will function very similarly to M-1, but without any roadside technology components. Rather, purely V2N interactions will occur between conference attendees in three different mobility contexts:

- The AV shuttles going from Huntington Place to ITSA hotels
- Attendees walking to/from the conference center and Downtown attractions
- Users of micromobility devices (like e-scooters) equipped with V2N-enabled OBUs

Each of these contextual user types will generate PSMs and/or BSMs using either a smartphone app or micromobility OBUs. For this to be possible, conference attendees will be encouraged to download an ITSA-sponsored, MDOT-branded smartphone app based on an existing V2N service offering that will serve as both their "personal OBU" and their interface for receiving V2N alerts directly to their person when making their way around Downtown Detroit. Using these message sets, the apps and/or OBUs can operate traditional V2V applications like collision avoidance and VRU alerts.

Figure 6 - The Downtown Experience Applications

Necessary enhancements to enable these applications include:

- A smartphone app that can serve the functions listed above

- V2N (and V2X) enabled Ultralight OBUs for installation on existing Downtown micromobility devices

Requirements List

MDOT is soliciting input from vendors and service providers who are interested in providing solutions to the needs and requirements of this demonstration concept. As MDOT has infrastructure solutions existing throughout the planned demonstration domains, some of these needs and requirements are partially met.

However, vendor diversity and equipment interoperability are important components of the demonstration. MDOT is very interested in both expansion and enhancement of the existing systems, so **vendors are encouraged to bring solutions forward even if its target needs and use cases are already met by an existing system in the list below.**

The requirements list groups demonstration needs into four categories:

- **Hardware** – physical products for installation in the field or on vehicles
- **Software** – applications to run on the physical products
- **Cloud Service** – applications to run in the cloud as an orchestration layer
- **Labor** – labor services for installing and integrating the holistic solution

Need	Domain	Category	Exists?	Existing Solution
Human-driven demo vehicle	I-94	Hardware	NO	-
Automated demo vehicle	M-1	Hardware	NO	-
Automated demo vehicle	Downtown	Hardware	NO	-
Demo vehicle TSPP application	M-1	Software	YES	MMITSS
Demo vehicle VRU application	M-1	Software	YES	WSP
Demo vehicle RLVW application	M-1	Software	NO	-
Demo vehicle Work zone TIM application	I-94	Software	YES	Danlaw
Demo vehicle Work zone V2N application	I-94	Software	NO	-
Demo vehicle Incident TIM application	I-94	Software	NO	-
Demo vehicle Incident V2N application	I-94	Software	NO	-
Demo vehicle EVA V2N application	I-94	Software	YES	HAAS Alert
Demo vehicle 5.9 GHz OBUs	ALL	Hardware	YES	Danlaw
Demo vehicle V2N (MQTT) "OBU" function	ALL	Hardware	NO	-
Demo vehicle processors	ALL	Hardware	YES	WSP
Demo vehicle displays	ALL	Hardware	NO	-
Demo vehicle equipment installer	ALL	Labor	NO	-
Demo vehicle application integrator	ALL	Labor	NO	-
M-1 infrastructure sensors	M-1	Hardware	YES	Bosch

M-1 infrastructure processing platform	M-1	Hardware	YES	Derq MH Corbin WSP
M-1 infrastructure VRU application	M-1	Software	YES	Derq MH Corbin
M-1 TSPP application	M-1	Software	YES	MMITSS
M-1 MAP/SPaT application	M-1	Software	YES	MMITSS
M-1 cooperative perception system	M-1	Hardware	YES	Derq
M-1 infrastructure RSUs	M-1	Hardware	YES	Danlaw
I-94 infrastructure sensors	I-94	Hardware	YES	Cavnue
I-94 infrastructure processing platform	I-94	Hardware	YES	Cavnue
I-94 infrastructure RSUs	I-94	Hardware	YES	Cavnue
I-94 Work Zone TIM application	I-94	Software	YES	MH Corbin
I-94 Incident TIM application	I-94	Software	YES	Cavnue
I-94 Work zone V2N application	I-94	Software	YES	HAAS Alert MH Corbin
I-94 Incident V2N application	I-94	Software	YES	Cavnue HAAS Alert
V2N MQTT smartphone app provider	ALL	Cloud Service	NO	-
V2N MQTT solution provider	ALL	Cloud Service	NO	-
V2N Cloud solution provider	ALL	Cloud Service	NO	-
V2N micromobility OBUs	Downtown	Hardware	NO	-
5.9 GHz micromobility OBUs	Downtown	Hardware	NO	-

One or more solution providers may be selected by MDOT to fulfill the above requirements.

Any interested parties wishing to partner with MDOT on this demonstration should reach out to Michele Mueller (MDOT): MuellerM2@michigan.gov