

Governor's Advisory Council on Connected and Automated Vehicles

Meeting Summary

September 15, 2021

Learn about Cavnue's infrastructure investment model and CAV-X project updates

1. **Welcome** – *Commissioner Margaret Anderson Kelliher and Phil Magney, Council Co-Chairs*

- Commissioner Anderson Kelliher welcomed Kyle Shelton, Director of CTS, as the newest Council member and expressed excitement for the Cavnue presentation. We are on the cusp of the passage of the federal infrastructure bill and MnDOT is looking for opportunities within the bill to advance CAV work.
- Co-chair Phil Magney also welcomed Kyle and mentioned VSI has been busy and is doing work with Utah DOT on AV readiness that can be shared with the Council in the future.
- **Council Member Attendees:** Co-chair Margaret Anderson Kelliher, Co-chair Phil Magney, Ryan Daniel, Shawn Lowry (for Dan Chen), Bret Weiss, Jon Hausladen, Patrick Weldon, Amber Backhaus, Damien Riehl, Myrna Peterson, Michael Gorman, Kyle Shelton
- **Ex-officio member and guest attendees:** Jason Gadd, Rep. Connie Bernardy, Todd Biewen, Thom Petersen, Gina Baas, Charlie Zelle, Chris Hadfield, Jacqueline Buck, Adesewa Adesiji, Bryan Nemeth, David Fenley, Mark Phillips, Alice Roberts-Davis, Fawkes Char, Nicole Nasan, Mark De la Vergn, Codie Leseman, Andrew Emanuele, Tyler Duvall, Ginny Crowson, John Harrington, Ashley Hudson, Jim Carlson, Chelsea Arbury Prorok, Tina Folch, Jason Bittner, Joel Carlson, Kelley Coyner, Tim Lynaugh, Melissa Reeder, Rob Parker, Alice Roberts-Davis, Ryan Daniel, Randy Sanford, Sarah Psick, Daryl Taavola, Tammy Meehan Russell, Megan Verdeja, Vicky Rizzolo, Wayne Pisinski, Carla Ferrucci, Steve Elkins, Frank Douma, Rob Parker, Wayne Sandberg
- **MnDOT attendees:** Kristin White, Jay Hietpas, Ben Lowndes, John Dukich, Erik Rudeen, Thomas Johnson-Kaiser

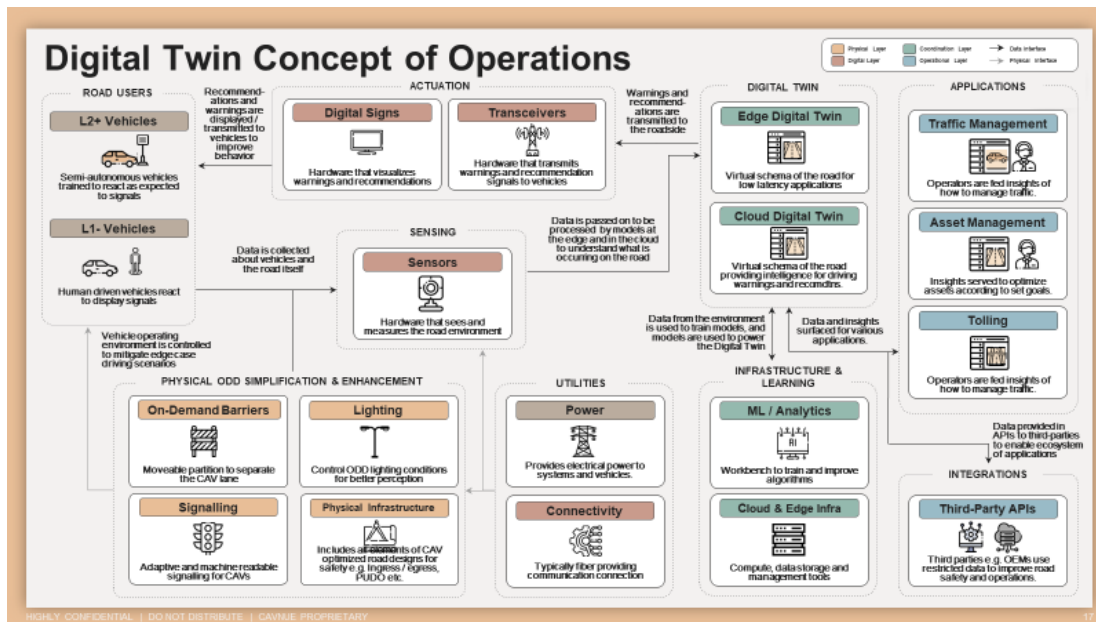
2. **Last Meeting Recap**

- Kristin White, CAV-X, shared what we heard from the last GAC meeting, including discussing and passing the CAV Guiding Principles and learning about CAV in long-range planning.
- Breakout discussions were held to discuss what participants want to see in future long-range plans. Topics of note were equity, safety, broadband, pedestrian safety and transit, and shifting travel patterns due to the pandemic.
- Also discussed future meeting topics including our outreach work, local CAV businesses, our CAV Safety Committee work and others.

3. **Cavnue Presentation**

- Tyler Duvall, CEO of Cavnue, presented on their work designing the physical, digital, coordination, and operational infrastructure to accelerate and realize the full potential of CAV to make roads safer, less congested, shared, and sustainable.

- Infrastructure is an evolving challenge due to safety concerns, congestion, freight, equity and changes to the climate.
- There is massive innovation and funding in the private sector for automated vehicle technology, but infrastructure complexity is significantly higher than what was thought 2-5 years ago which has led to delays in technology being used. Cavnu is seeking to help solve this challenge.
- There is a gap in knowledge on the nature of the investment the auto industry is making on automated vehicles. By 2030 the vast majority of vehicles coming off the assembly line will be level 2+ vehicles.
- Road infrastructure isn't keeping up with vehicle technology. There are challenges in modeling roadway unpredictability. It is very costly and complex to update infrastructure. The environment is unpredictable, especially with Minnesota winters. Supportive infrastructure can radically simplify the complexity of the problem by simplifying the environment, providing sensing and seeing information to vehicles, informing and coordinating vehicles, and providing operating rules.
- The goal is to simplify and enhance the driving environment to address disengagements and enable a hands-off, eyes-off driving experience. This could start with a barriered AV lane but could eventually move to double white strip divider.
- Cavnu team includes a variety of experts in the areas of roadway development and technology.
- The Cavnu infrastructure plan has the intention to make it easier for vehicles and people to see the road ahead, talk to vehicles and people to provide deeper insights about the complex roadway operating environment, including events happening ahead, and simplify the road operating environment for vehicles and people.
- Cavnu's Digital Twin Concept of Operations includes advanced camera technology and machine learning backed with advanced software platform



- Cavnu can add value among numerous users including trucking, transit, passenger, operations, and maintenance.
- Michigan project in the Detroit and Ann Arbor corridor of about 40 miles on I-94. Cavnu is in a pre-development agreement and the project is in feasibility analysis stage.

- Cavnu sees the potential of I-35 and Minnesota for a CAV corridor due to potential to integrate with existing managed lanes on I-35, the potential freight connections to the Duluth port, and the lessons learned from I-35 snowplow activation. Cavnu's goal is to be an operating partner and help deploy technology faster than could be done on our own.
- Question and answer session
 - Kyle Shelton asked how Cavnu thinks about the transition space of highways to other roadways. The goal is to ramp up to urban roadways and begin testing in those situations in the next 18-24 months. Cavnu is starting with an easier environment in order to build trust in the technology.
 - Bret Weiss asked how Cavnu envisions their partnerships with MnDOT or other government agencies. The idea is to deploy and manage the technology and CAV lanes with a long-term agreement. They are flexible with the goal of getting the technology out to the public. They want to take the best of the best technology and integrate and implement it. Upgrading technology as needed would be part of the plan.
 - Damien Riehl asked about how Cavnu imagines the dedicated lane with barriers handling winter weather and snow plowing. Solutions could include removing the barrier or developing a snowplow solution that will require innovation. Cavnu is interested and partnering with experts to brainstorm best practices.
 - Michael Gorman asked if Cavnu is taking an open architecture approach or an integrated walled garden approach. Cavnu plans to spend most of their IP investment on their Digital Twin traffic management concept and will use and integrate other technologies as needed. Cavnu leans towards open architecture and wants their system to work for all vehicles.
 - Phil Magney suggested that Cavnu create an [operational design domain](#) and Cavnu agreed.
 - Jon Hausladen asked if the assumption is that the corridors would be toll roads. Cavnu sees that as likely but that is a public policy decision that the state would need to decide.
 - Kyle Shelton asked Cavnu to share what they see as the relationship between CAV lanes and other uses of the right of way. They see the lanes as dedicated, but not exclusive. Tyler suggested that managed lanes are an excellent opportunity to be CAV lanes. MnDOT is a proponent of managed lanes but does not include them in future plans as that is not a decision MnDOT and unilaterally make for future projects.
 - Kristin White asked about how a lack of industry consensus on connected vehicle infrastructure plays into Cavnu's plan. They believe long term V2X platforms will be needed but understands this will not happen overnight.
 - Kristin also asked how Cavnu approaches the commercialization of the right of way. At a national level there is recognition that there is value in the right of way. FHWA tries to partner with states to be flexible in the use of the right of way. A challenge is that when administrations change the policies change as well.
- Commissioner Anderson Kelliher thanked Cavnu for their presentation and their help with envisioning the future.

4. **Minnesota CAV Updates**

- MnDOT CAV-X Office provided updates on CAV projects happening throughout Minnesota
- **Med City Mover:** Two level 4 automated Easy Mile shuttles in operation in Rochester. The shuttles began serving the public September 1 and will continue for 12 months. The shuttles will have an onboard ambassador and will be free for the public to use. The project goals include

engaging and introducing Minnesotans to the technology, improving how automated vehicles function in winter weather, identifying changes to infrastructure needed to safely operate automated vehicles on public roads, and enhancing the transportation experience for Rochester residents, businesses, and visitors. The shuttle operates on a pre-programmed route in downtown Rochester that is a little more than a one-mile loop and has two stops. Planned hours of operations are 9 am – 3:30 pm Monday-Friday, and 9 am – 5 pm, Saturday and Sunday. Check out more at the project website at www.medcitymover.com

- **Highway 52 CAV Corridor Planning:** The purpose of the project is developing partnerships along the corridor, understanding CAV technologies, selecting technology applications, and advancing safety, equity, accessibility, mobility, and sustainability on Highway 52. The top five Highway 52 challenges identified are weather events, challenges in work zones, the Lafayette Bridge, enhanced traveler information, and safety for people and vehicles on the shoulder. The recommended CAV applications are intelligent work zones, hazard warning systems, and traveler information. Project next steps include CAV Challenge opportunities, integration with existing projects, and a standalone RFP.
- **CAV Traveler Alert System:** The project goals are to improve the safety of roadway users and workers by informing motorists of maintenance and snowplow vehicles in their path of travel and to communicate vehicle proximity information to motorists' smartphones in selected situations. Testing of the system completed by MnDOT Maintenance staff and the next step is public outreach.
- **Lane Keeping Assistance:** A lane keeping system was developed by the University of Minnesota to support plow operators when visibility is poor. The objectives of the project are to improve low efficiency by allowing operators to maintain a desired path under poor visibility conditions, design and develop a forward-looking hazard detection system, and reduce system cost and improve the system. In the 2020-2021 winter the system was deployed to four plows across Minnesota. The system's strengths and limitations were evaluated, and user feedback gathered. For the 2021-2022 winter the upgraded system will be deployed to nine plows, one in each MnDOT district and Dakota County with the goal of gathering additional feedback.
- **Autonomous Truck Mounted Attenuator:** Minnesota just concluded the first phase of testing of this technology in Lakeville and will be moving into a phase 2 of testing to see how MnDOT can integrate these technologies into other operations. Minnesota is the first state to use the algorithm where the lead and following vehicle are offset.
- **Twin Cities Startup Week:** Twin Cities Startup Week, taking place the week of September 20, is a unique event where over 17,000 attendees participate in 200+ events focused on educating, networking, and inspiring Twin Cities diverse entrepreneurs. Event programming, which covers a variety of industries, typically consists of workshops, sessions, and networking hosted by local organizations and partners, showcasing Minnesota as a center of innovation. The MnDOT CAV-X Office is partnering to help put on a few sessions, including the Shark Tank Reverse Pitch event on September 20. For the event, entrepreneurs, start-ups, university researchers, innovators etc. will submit ideas on how to use automation, connectivity, and other tech solutions to advance livability, mobility, and sustainability. The top ideas submitters will present their ideas to a panel of judges during the event. All Council members and meeting attendees are encouraged to participate in Twin Cities Startup Week.
- **CAV Career Pathways Camp:** In mid-August a one-week summer CAV Career Pathways Camp was delivered for a diverse group of 16 high school students. The camp was sponsored and delivered by Center for Transportation Studies with one-time funding provided by Federal Highway Administration. The goal of the camp was to introduce students to CAV technologies and to CAV educational and career opportunities. CTS partnered with MnDOT, consultants, City

of Minneapolis, vehicle vendors, and White Bear Lake High School to deliver a curriculum that included presentations, tours, demonstrations, and hand-on activities. Highlights included a Tesla demonstration, CAV scenario planning, visiting White Bear Lake Subaru shop, and riding an autonomous shuttle. Overall, very positive feedback from students.

- **National Coordination:** MnDOT participates in ITS America policy work that recently completed AV policy principals and recommendations. Minnesota is championing AASHTO CAV Guiding Principles for all state DOTs. MAASTO CAV Committee is working on a ten year CAV regional strategy. MnDOT also participates in a series of pooled fund studies with other states, including AV freight and platooning, connected vehicles, AV roadmap, mobility on demand, and AV maintenance.
- Commissioner Anderson Kelliher highlighted that MnDOT CAV-X is leading the country in the CAV field.

5. Public Comment

- Tammy Meehan Russell thanked Cavnu for their presentation and highlighted the success and positive feedback of CAV camp and hopes more, similar CAV camps can take place throughout Minnesota.

6. Closing

- Upcoming events
 - Mobility Fair – Rochester, September 16th from 1-6 PM
 - Twin Cities Startup Week – University Enterprise Labs, St. Paul, September 20th from 8-5
 - ITS Minnesota Fall Forum – September 28th – 30th Online from 9-12:30 PM
 - Med City Mover Public Kickoff – September 30th in Rochester at 11:30 AM
 - Next Council Meeting – December 8th from 10-12:30 (invitation forthcoming)
- Commissioner Anderson Kelliher and Phil Magney thanked everyone for attending and encouraged everyone to stay engaged with all of the exciting CAV events and projects taking place this fall.

Council adjourned