Connecting intersections: Moving V2X from concept to deployment

Econolite, Umovity ITS chief technology officer Hans M. Molin highlights a pivotal moment for transportation.

Historically, improving mobility and safety was largely done through adopting increasingly sophisticated new traffic management systems and technologies. Yet one of the most transformative technologies is not a new concept: vehicle to everything (V2X) communications.

V2X communications enable vehicles to wirelessly communicate with infrastructure (V2I), vehicles (V2V), network systems (V2N), and pedestrians (V2P) in real-time. The mobility intelligence and return on investment (ROI) promise is compelling; however, it requires a willingness to integrate an ecosystem of intelligent intersections powered by advanced traffic controllers, open architecture software, traffic sensors, edge computing and network communications. Agencies have already deployed many of these, but often systems are not connected to each other to enable the most valuable cross-pollination of data.

The foundation for connected mobility

The success of V2X depends on intersections functioning as connected nodes within the transportation network. Connected intersections enable centralised systems to extract, transform and load (ETL) real-time roadway data, creating a network whereby infrastructure can exchange Signal Phase and Timing (SPaT), MAP and other connected vehicle messages while accommodating evolving DSRC, C-V2X and SAE J2735 standards.

At the intersection, traffic cabinets, traffic signal controllers and their firmware must provide this intelligent foundation. The key here is interoperability – they must support open architecture principles to help facilitate seamless communications between roadway users and infrastructure, communications with the traffic management centre (TMC), sensors and emerging V2X solutions without becoming locked into proprietary systems.

Equally important is the role of centralised mobility management software or advanced traffic management system (ATMS), providing agencies with access to the data and derived information needed for securely managing connected vehicles across entire networks.

From concept to proven results

A compelling example is the Innovate Mound project in Macomb County, Michigan, US. The opportunity was to create a corridor capable of supporting connected vehicle technologies, real-time traffic optimisation and multimodal mobility applications.

A readily available open-architecture traffic controller platform became a key enabler. Roadside units deployed throughout the corridor broadcast SPaT and MAP messages so connected vehicles can better anticipate and navigate intersections more efficiently. The infrastructure also supports safety applications, including wrong-way detection, queue warnings, weather-responsive operations, emergency vehicle pre-emption and freight priority. These capabilities demonstrate how V2X can move beyond theoretical concepts to deliver meaningful operational improvements that enhance mobility and safety.



Hans M. Molin

Enhancing safety through real-time awareness

V2X introduces new levels of situational awareness by enabling connected intersections and roadway users to continuously exchange information. When integrated with intelligent controllers, sensors, probe data sources and a centralised, cloud-native ATMS platform capable of ingesting and processing real-time data, agencies gain greater visibility into network operations and even forecast conditions.

Connected intersections can also provide roadway users with advance warning about emergencies, queue conditions, wrong-way movements, pedestrian activity and other potential hazards. This real-time exchange of information helps reduce uncertainty and improves decision-making for all roadway users.

What's next?

The transportation industry stands at a pivotal moment. Connected vehicles are not a future concept; they are an operational reality. The challenge now is accelerating V2X adoption. Fortunately, the standardised and interoperable hardware and software systems are available and, in many cases, already deployed to help cost-effectively drive the adoption.

As projects like Innovate Mound demonstrate, the future of transportation will not simply be about moving vehicles more efficiently. It will be about leveraging available technologies to establish the connected ecosystems where intersections, vehicles, and users communicate seamlessly to improve safety and unlock the full potential of connected mobility.

The journey toward that future is already underway and V2X is helping communicate the road ahead.



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