Vehicle-to-vehicle (V2V) communication

Vehicle-to-vehicle (V2V) communication's ability to wirelessly exchange information about the speed and position of surrounding vehicles shows great promise in helping to avoid crashes, ease traffic congestion, and improve the environment. But the greatest benefits can only be achieved when all vehicles can communicate with each other. That's why NHTSA has been working with the automotive industry and academic institutions for more than a decade to advance V2V communication's lifesaving potential into reality.

Vehicle-to-vehicle (V2V) communication enables vehicles to wirelessly exchange information about their speed, location, and heading. The technology behind V2V communication allows vehicles to broadcast and receive omni-directional messages (up to 10 times per second), creating a 360-degree "awareness" of other vehicles in proximity. Vehicles equipped with appropriate software (or safety applications) can use the messages from surrounding vehicles to determine potential crash threats as they develop. The technology can then employ visual, tactile, and audible alerts—or, a combination of these alerts—to warn drivers. These alerts allow drivers the ability to take action to avoid crashes.

These V2V communication messages have a range of more than 300 meters and can detect dangers obscured by traffic, terrain, or weather. V2V communication extends and enhances currently available crash avoidance systems that use radars and cameras to detect collision threats. This new technology doesn't just help drivers survive a crash—it helps them avoid the crash altogether.

Vehicles that could use V2V communication technology range from cars and trucks to buses and motorcycles. Even bicycles and pedestrians may one day leverage V2V communication technology to enhance their visibility to motorists. Additionally, vehicle information communicated does not identify the driver or vehicle, and technical controls are available to deter vehicle tracking and tampering with the system.

V2V communication technology can increase the performance of vehicle safety systems and help save lives. There were an estimated 6.8 million police-reported crashes in 2019, resulting in 36,096 fatalities and an estimated 2.7 million people injured. Connected vehicle technologies will provide drivers with the tools they need to anticipate potential crashes and significantly reduce the number of lives lost each year.

How does V2V communication work?

Vehicle-to-vehicle (V2V) communication works with DSRC (Dedicated Short Range Communications), which is a type of Wi-Fi that sends brief messages up to 10 times a second over short distances, about 1,000 feet. On a busy highway, vehicles might send automated messages to each other communicating things like “Road is slippery,” or “Ambulance coming!” or “Traveling 63 mph, road clear.”

This technology already exists. In Japan, certain Toyota models have V2V communication built in that conveys a few simple data points: location, speed, and heading. Soon, it’ll be widespread in the United States, too, as new cars and light trucks may be required to include V2V technology by 2023. Navigant Research predicts “that by 2025, more than 20 million vehicles will be sold annually with DSRC-based V2V in North America and nearly 70 million globally.”

The technology might already be outdated, however. While carmakers work to install DSRC capabilities in new cars, others are asking, “Why can’t we just use our phones?” An app called Nexar has a V2V communication function that sends traffic alerts to other, nearby phones running the app.

The pros of V2V communication

It could prevent crashes. The vast majority of car crashes are caused by human error. The U.S. Department of Transportation says car-to-car communication can help, as it has the potential “to significantly reduce many of the most deadly types of crashes through real time advisories alerting drivers to imminent hazards.”

It could ease traffic congestion. Imagine if all the individual data points from millions of cars were sent to a central hub. With so much real-time traffic data, transportation managers could adjust traffic light timing and redirect traffic to make rush hour flow more smoothly. Not only that, but each individual car could use the technology to maintain a consistent following distance. Imagine law abiding, organized highways, instead of hundreds of drivers jockeying for position, changing in and out of lanes.

It could improve fuel efficiency. A fleet of trucks equipped with vehicle-to-vehicle technology can do something called platooning: driving in close formation, like a flock of geese, to reduce drag and save gas. Platooning results in fuel consumption savings of up to 5 percent for the lead truck and up to 10 percent for the trucks following in formation, tests have found.

The drawbacks of V2V communication

Drivers should be concerned about their privacy. V2V data can reveal all kinds of things about you: where you’re going and when, as well as your driving habits. Who has access to this data? And how might they use it? “We have learned the hard way that both the government and private companies will go to great lengths to track vehicles—just look at the proliferation of Automated License Plate Readers (ALPR),” the Electronic Frontier Foundation warns.

Some of the key vehicle-to-vehicle safely applications are as follows:

- **Blind Spot Warning (BSW) & Lane Change Warning(LCW)** – While changing a lane, the BSW/LCW feature of V2X notifies the driver about other vehicles traveling in the same direction to avoid the collision.
- **Intersection Movement Assist (IMA)** – IMA sends an alert to the driver in case of a potential collision at cross points in the road.
- **Do Not Pass Warning (DNPW)** – DNPW is similar to the BSW/LCW feature, which notifies the driver about another vehicle traveling in the vicinity, but in the opposite direction.
- **Left Turn Assist (LTA) & Right Turn Assist (RTA)** – It is a feature similar to IMA that notifies the driver of a potential collision with another vehicle at the intersection while turning left/right.
- **Forward Collision Warning (FCW)** – FCW assists the driver in maintaining a safe distance with the vehicle in the front to avoid the rear-end collision.
- **Electronic Emergency Brake Light (EEBL)** – On the application of the emergency brake, a notification is sent to the surrounding vehicles about the braking event to alert the surrounding vehicles to avoid any accidents.