U.S. Department of Transportation

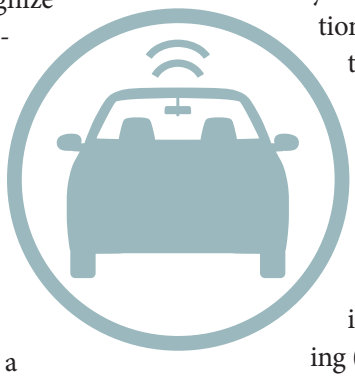
VEHICLE-TO-VEHICLE COMMUNICATION TECHNOLOGY

NHTSA ISSUES NOTICE OF PROPOSED RULEMAKING AND RESEARCH REPORT ON VEHICLE-TO-VEHICLE COMMUNICATIONS

The U.S. Department of Transportation's National Highway Traffic Safety Administration has issued a Notice of Proposed Rulemaking (NPRM) to mandate vehicle-to-vehicle (V2V) communication technology for new light vehicles in the United States.

What is V2V?

First and foremost, V2V technology is about crash prevention. Approximately 94 percent of crashes involve human error; V2V allows vehicles to effectively recognize collision situations, or threats, earlier and better than a human driver can.



V2V is a crash avoidance technology that relies on communication of information between nearby vehicles to warn drivers about potentially dangerous situations that could lead to crashes. For example, V2V could help warn a driver that a vehicle ahead is braking and they need to slow down, or let a driver know that it is not safe to proceed through an intersection because another car, unseen by the driver, is quickly approaching.

How does V2V work?

V2V communications systems use dedicated short-range communications (DSRC) technology to exchange basic data with other vehicles about factors such as location, speed, direction and braking status. V2V devices use this information from other vehicles to determine if a warning to the vehicle's driver is needed to help prevent a crash.

What is in the rulemaking proposal?

The proposed rulemaking is the culmination of more than a decade of work in partnership with others in the U.S. Department of Transportation (DOT), the automotive industry, State and local transportation departments, and academic institutions to prove out and develop consensus standards that support a coordinated, national deployment of V2V technology. This is the first proposed mandate of V2V technology worldwide.

NHTSA's NPRM consists of a proposal to mandate V2V technology in all new light vehicles by utilizing the radio transmission protocols and spectrum bandwidth collectively known as dedicated short-range communications (DSRC). The agency is proposing to require that all V2V devices must "speak the same language" through a standard technology. The agency is also proposing that privacy and security measures are employed in any V2V device.

The NPRM follows NHTSA's previously issued advance notice of proposed rulemaking (ANPRM) and research report, "Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application," in August 2014, and directly supports Secretary Foxx's announcement on February 3, 2014, that the Department would work on a regulatory proposal to require V2V devices in new vehicles.

What are the advantages of V2V

V2V messages using DSRC technology would have a range of approximately 300 meters, which exceeds the capabilities of systems with ultrasonic sensors, cameras, and radar, allowing greater capability and time to warn drivers. In addition, these radio messages can "see" around corners or "through" other vehicles, addressing scenarios such as those, for example, where an oncoming vehicle emerges from behind a truck or from a blind alley. In those situations, V2V communications can detect the threat much sooner than radar or camera sensors can

V2V technology can also be combined with existing on-vehicle sensors, such as radar and cameras, to provide even greater benefits than either approach alone. This combined approach could also augment system accuracy becoming a foundation for realizing the safe deployment of automated vehicles on our Nation's roadways. For more detailed information on how NHTSA believes the various levels of vehicle automation will help reduce crashes and how on-board systems may someday work cooperatively with V2V technology, see NHTSA's Preliminary Statement of Policy on Vehicle Automation (May 2013).

V2V devices can be installed directly in vehicles when the vehicles are originally manufactured, after initial manufacture via an "aftermarket" installation, or could potentially be carried into vehicles by drivers in the form of a hand-held device (and perhaps, eventually, even as a function on a smartphone).

What data is exchanged?

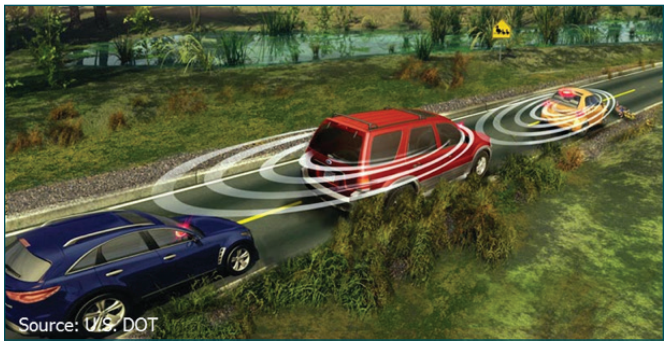
The data, known as the "basic safety message" (BSM), is exchanged between vehicles and contains vehicle dynamics information such as heading, speed, and location. The BSM is updated and broadcast up to 10 times per second to surrounding vehicles. The information is received by other vehicles equipped with V2V devices and processed to determine collision threats. Based on that information, if required, a warning could be issued to drivers to take appropriate action to avoid an imminent crash.

What is V2V's potential to address vehicle crashes

V2V can enable a number of different safety "applications" that help drivers with different aspects of driving, like warning drivers about stopped vehicles in the road ahead, vehicles speeding unexpectedly through intersections, vehicles in blind spots, and more.

The agency's analysis of two potential applications, "intersection movement assist" (IMA) and "left turn assist" (LTA), indicated there could be an average 50-percent reduction in crashes, injuries, and fatalities just through these two applications.

Applied to the full national vehicle fleet, this could potentially reduce 400,000 to 600,000 crashes, prevent 190,000 to 270,000 injuries and save 780 to 1,080 lives each year once fully deployed. The addition of other V2V and vehicle-to-infrastructure (V2I) safety applications would save even more lives. Taken together, all of these applications could eliminate or reduce the severity of up to 80 percent of non-impaired-driving crashes.



What vehicles are affected by this NPRM

The NPRM applies to light-duty vehicles (passenger cars and trucks). However, NHTSA believes that V2V technology also holds great promise for medium- and heavy-duty trucks and buses, and working with industry, the Agency is continuing research to adapt the technology for these vehicles.

What are dedicated short-range communications?

Dedicated short-range communications (DSRC) are two-way, wireless communications permitting secure and fast messaging needed for safety applications, where "short range" is approximately 300 meters depending on the surrounding environment. These communications occur in a 75 MHz band of the 5.9 GHz spectrum, which has been allocated by the FCC for use by Intelligent Transportations Systems (ITS) vehicle safety and mobility applications. This band affords a relatively clean operating environment with very few pre-existing users, allowing for relatively unimpeded and interference-free communication zone.

What are the practical applications enabled by V2V

V2V can enable warnings that are not currently available to drivers and that might not otherwise be available without V2V. Some of the potential applications of V2V technology include:

Intersection Movement Assist

Intersection Movement Assist (IMA) warns the driver when it is not safe to enter an intersection because of high potential for colliding with one or more vehicles.

Left Turn Assist

Left Turn Assist (LTA) warns the driver there is high probability they will collide with an oncoming vehicle when making a left turn. This is especially critical when the driver's line-of-sight is blocked by a vehicle also making a left turn from the opposite direction.

Emergency Electronic Brake Light

An Emergency Electronic Brake Light (EEBL) warns the driver to be prepared to take action when a V2V-equipped vehicle traveling in the same direction but not in the driver's line-of-sight decelerates quickly. V2V would allow the driver to "see through" vehicles or poor weather conditions to know that traffic ahead may be coming to an abrupt stop.

Forward Collision Warning

Forward Collision Warning (FCW) alerts the driver of the risk of an impending rear-end collision with another vehicle ahead in traffic in the same lane and direction of travel.

Blind Spot Warning and Lane Change Warning

Blind Spot Warning (BSW) notifies the driver when a vehicle in an adjacent lane is positioned in the driver's "blind spot" zone. If the driver were to attempt a lane change, Lane Change Warning (LCW) warns the driver of a vehicle's presence during a lane change attempt if another vehicle is present in or approaching the "blind-spot" zone.

Do Not Pass Warning

Do Not Pass Warning (DNPW) tells the driver that it is not safe to pass a slower-moving vehicle because vehicles are approaching from the opposite direction in the passing lane.

How are V2V and automated vehicle technologies related?

V2V and automated vehicle technologies are distinct technologies, which each carry significant safety potential. It is the Department's view that these technologies are highly complementary to each other, and when deployed in concert will have significant safety benefits. Vehicles that contain automated driving functions—such as automated emergency braking and adaptive cruise control—generally rely on an on-board suite of sensors, such as radar and cameras. V2V offers an additional source of data inputs, which could help these automated technologies better avoid or mitigate crashes.

V2V expands sensing performance beyond what is achievable by "line-of-sight" sensors (e.g., LIDAR, radar, cameras). With V2V, a vehicle gains capabilities like "seeing" around corners, buildings or trucks, and many vehicles ahead or behind. V2V has a larger effective sensing range than conventional sensors, providing additional lead time for decision algorithms, which is essential for higher levels of automation. V2V packs a rich set of "vehicle performance and status" information directly from the source, which enables automation algorithms to "know" what surrounding vehicles are doing and not have to guess or estimate what they may be doing.

Is V2V a "must have" for highly automated vehicles?

Our discussions with both traditional automotive and "high-tech" companies involved in development of highly automated vehicles suggests that within a given operational design domain (ODD) as specified for a particular product model, safe operation of such automated vehicles is possible without V2V. However, industry stakeholders also agree that, if available, they would utilize V2V information to enhance their systems, and even further, it would not be possible to optimize the benefits of automated vehicles without V2V.

When the proposed V2V mandate becomes a Final Rule, the technology will be required on all new light-duty vehicles—including highly automated passenger vehicles.

Will V2V be vulnerable to cyber-attacks?

Vehicle cybersecurity is a high priority for NHTSA. In October 2016, NHTSA issued proposed guidance for improving motor vehicle cybersecurity. The V2V NPRM promotes cybersecurity protection to ensure that V2V

technologies are safeguarded from unauthorized access. The current proposed design for the V2V system employs a security level of at least 128-bit encryption and is NIST compliant.

The proposed rulemaking remains consistent with the security approach detailed in NHTSA's V2V research report, where NHTSA and industry research partners developed a security system design based on the widely and successfully applied public key infrastructure, employing digital certificates. The system design consists of three primary components:

1. A message authentication proposal designed to enhance confidence in the authenticity of V2V messages and secure the exchange of safety data;
2. V2V devices, which broadcast and receive safety messages and ensure that each incoming message is checked to detect and avoid misbehavior; and
3. A misbehavior reporting requirement to share signatures misconfigured, or malicious vehicles enabling other vehicles to block V2V messages from misbehaving vehicles.

In addition, the Agency is also seeking comments on potential alternative approaches to security and looks forward to receiving comments on both the proposal and the alternatives presented in the NPRM.

Will drivers' privacy be at risk when V2V is deployed?

By design, the V2V system will not collect, broadcast, or share information linked or linkable, as a practical matter, to individuals or their vehicles. V2V-enabled vehicles exchange only generic safety information. The system is designed to operate without using any personal information about specific vehicles or drivers.

How does the public submit comments?

To submit comments on the ANPRM and research report, visit www.regulations.gov and enter Docket No. NHTSA-2016-0126, or visit www.safercar.gov/v2v. Comments will be accepted for 90 days; late comments will be considered to the extent practicable.

What are the next steps?

NHTSA will review the submitted comments and adjust the proposal as appropriate before issuing a final rule.

U.S. Department of Transportation
National Highway Traffic Safety Administration

12850-121316-v2