Photo Source: USDOT

HOW CONNECTED VEHICLES WORK

Connected vehicles have the potential to transform the way Americans travel through the creation of a safe, interoperable wireless communications network—a system that includes cars, buses, trucks, trains, traffic signals, smart phones, and other devices. In the past, the U.S. Department of Transportation (USDOT) has focused on helping people survive crashes. Connected vehicle technology will change that paradigm by giving people the tools to *avoid* crashes.

Why Connected Vehicle Technologies Are Needed

Connected vehicle technologies aim to tackle some of the biggest challenges in the surface transportation industry—in the areas of safety, mobility, and environment.

- **Safety:** According to the National Highway Traffic Safety Administration (NHTSA), there were 5.6 million crashes in 2013. The number of fatalities from vehicle crashes is falling but still accounted for 32,719 deaths. Connected vehicle technologies will give all drivers the tools they need to anticipate potential crashes and significantly reduce the number of lives lost each year.

- **Mobility:** According to the Texas Transportation Institute, U.S. highway users wasted 6.9 billion hours stuck in traffic in 2014. Connected vehicle mobility applications will enable system users and system operators to make smart choices that reduce travel delay.

- **Environment:** According to the Texas Transportation Institute, the total amount of wasted fuel topped 3.1 billion gallons in 2014. Connected vehicle environmental applications will give motorists the real time information they need to make "green" transportation choices.

Connected vehicles feature safety warnings that alert drivers of potentially dangerous conditions — impending collisions, icy roads and dangerous curves — before the driver is aware of them. The technology is expected to reduce unimpaired vehicle crashes by 80 percent.

LIMIT 35 SAFETY | MOBILITY | ENVIRONMENT

Connected vehicle applications provide connectivity between and among vehicles, infrastructure, and wireless devices to:

- Enable crash prevention
- Enable safety, mobility and environmental benefits
- Provide continuous real-time connectivity to all system users

Motor vehicle crashes are the leading cause of death for people ages 4, 11 through 27, according to the Centers for Disease Control.

Agencies involved in connected vehicle research:

- Federal Highway Administration (FHWA)
- Federal Motor Carrier Safety Administration (FMCSA)
- Federal Railroad Administration (FRA)
- Federal Transit Administration (FTA)
- National Highway Traffic Safety Administration (NHTSA)
- Office of the Assistant Secretary for Research and Technology

U.S. Department of Transportation

How Connected Vehicles Will Work

With connected vehicle technology, drivers will get warning messages in their vehicles when a potential crash is imminent.

Safety-related systems for connected vehicle technology will likely be based on dedicated short-range communications (DSRC), a technology similar to WiFi. DSRC is fast, secure, and reliable. Non-safety applications may be based on different types of wireless technology. Cars, trucks, buses, and other vehicles will be able to "talk" to each other with in-vehicle or aftermarket devices that continuously share important safety and mobility information with each other. Connected vehicles can also use wireless communication to "talk" to traffic signals, work zones, toll booths, school zones, and other types of infrastructure. The vehicle information communicated does not identify the driver or vehicle, and technical controls have been put in place to help prevent vehicle tracking and tampering with the system.

How Connected Vehicles Will Improve Safety

Connected vehicle safety applications will enable drivers to have 360-degree awareness of hazards and situations they cannot even see. Through in-car warnings, drivers will be alerted to imminent crash situations, such as merging trucks, cars in the driver's blind side, or when a vehicle ahead brakes suddenly. By communicating with roadside infrastructure, drivers will be alerted when they are entering a school zone, if workers are on the roadside, and if an upcoming traffic light is about to change.

Pivotal work is being conducted to guarantee that these driver warnings will not be a distraction and that people will only be made aware when they are approaching danger.

The connected vehicle system will be similar in many ways to other wireless networks and will create a dynamic transportation network based on an open platform to allow for new and creative applications. Open standards allow anyone to develop new products and applications that will work in this space.

How Connected Vehicles Will Keep People Moving

Private signals in vehicles will help generate new data about how, when, and where vehicles travel—information that will then be analyzed by transportation managers to help make roads safer and less congested.

The same signals could also be shared among mobile devices and roadside sensors. This exciting new data-rich environment will also be the genesis for a multitude of new mobility applications that will help to keep traffic flowing and make it easier for people to plan their travel experience. Imagine, for instance, apps that can help you find open parking spaces, locate available last-minute ride-share partners, guarantee you make your bus or train connection, or help a blind pedestrian cross the street. With an open source system for mobility applications, there will be minimal restrictions and limitless opportunities.

How Connected Vehicles Will Improve The Environment

Mitigating greenhouse gas (GHG) contributions is everyone's responsibility. In 2013, the transportation sector contributed 27 percent of the country's GHG emissions, according to the Environmental Protection Agency's Inventory of U.S. Greenhouse Gas Emissions and Sinks. Connected vehicle technologies will generate real-time data that drivers and transportation managers can use to make green transportation choices.

For example, real-time information about traffic conditions will help motorists eliminate unnecessary stops and vehicles reach optimal fuel-efficiency. Informed travelers may also be able to avoid congestion by taking alternate routes or public transit, or rescheduling their trip—any of which can make their trip more eco-friendly. By providing real-time information, travelers will have a realistic idea of when transit vehicles will arrive; they will also be able to improve bus and train connections, and this will help make public transportation more appealing to the average traveler.

The U.S. Government's Role

The USDOT's Intelligent Transportation Systems (ITS) Joint Program Office fosters the development and future deployment of connected vehicle technologies. But connected vehicle research involves all agencies within the USDOT including NHTSA, the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration, the Federal Transit Administration, and the Federal Railroad Administration, as well as several leading auto manufacturers and academic research institutions.

In August of 2014, NHTSA announced that it would begin taking steps to enable vehicle-to-vehicle (V2V) communication technology for light vehicles and is now working on a regulatory rulemaking that will require its installation in all new light vehicles in the coming years. In May 2015, Secretary Foxx announced the USDOT would accelerate the deployment of connected vehicles. NHTSA will move ahead of its timetable for the proposed V2V rule. The proposal is expected in 2016. In 2015, the FHWA will release a vehicle-to-infrastructure (V2I) guidance document to assist transportation managers and operators interested in adapting their traffic signals and other roadside devices so they are compatible with the new connected vehicles.