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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 3 through 34, 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)
- Maritime Administration (MARAD)
- National Highway Traffic Safety Administration (NHTSA)
- Research and Innovative Technology Administration (RITA)

How Connected Vehicles Work

INTRODUCTION

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, cell phones, and other devices. In the past, the U.S. Department of Transportation (U.S. DOT) 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 5.5 million crashes in 2009 and 2.2 million injuries. The number of fatalities from vehicle crashes is falling but still accounted for 32,788 deaths in 2010. 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 4.8 billion hours stuck in traffic in 2010—nearly one full work week (or vacation week) for every traveler. 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 3.9 billion gallons in 2009, the latest year that this data is available. 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. Research from NHTSA found that connected vehicle technology has the potential to address vehicle crashes by unimpaired drivers, but more research needs to be done to understand the true effectiveness of the technology.



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

HOW CONNECTED VEHICLES WILL WORK

A system of connected vehicles is still in development, and plenty of research still needs to be done. 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, reliable and operates on a dedicated spectrum. 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 after market 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 is anonymous, so vehicles cannot be tracked and the system is secure against tampering.

HOW CONNECTED VEHICLES WILL IMPROVE SAFETY

Connected vehicle **safety applications** will enable drivers to have 360-degree awareness of hazards and situations they can not even see. Through in-car warnings, vehicle operators will be alerted to imminent crash situations, such as merging trucks, cars in the driver’s blind side, or when





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a vehicle ahead of them brakes suddenly. By communicating with roadside infrastructure, drivers will be alerted when they are entering a school zone, if workers are on the side of the road, 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

Anonymous 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 taxis, 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. The transportation sector contributes roughly 28% 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.



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In-vehicle devices will use V2V technology to alert drivers of dangerous situations

One example is how real-time information about traffic conditions will help motorists eliminate unnecessary stops and let their 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. Connected vehicles also include buses, trains, and other forms of public transit. So, 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 U.S. DOT's Research and Innovative Technology Administration's (RITA) Intelligent Transportation Systems (ITS) Joint Program Office fosters the development and future deployment of these connected vehicle technologies. But Connected Vehicle research involves all agencies within U.S. DOT including NHTSA, the Federal Highway Administration (FHWA), the Federal Motor Carrier Safety Administration (FMCSA), Federal Transit Administration and the Federal Railroad Administration.

U.S. DOT and its public and private partners are working to address the technical, safety and policy challenges and are helping to create the standards and the wireless architecture that will be the backbone of the system.

Connected vehicle research will leverage the potentially transformative capabilities of wireless technology to make surface transportation safer, smarter and greener. If successful, connected vehicles will ultimately enhance the mobility and quality of life of all Americans, while helping to reduce the environmental impact of surface transportation.

For more information about this initiative, please contact

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