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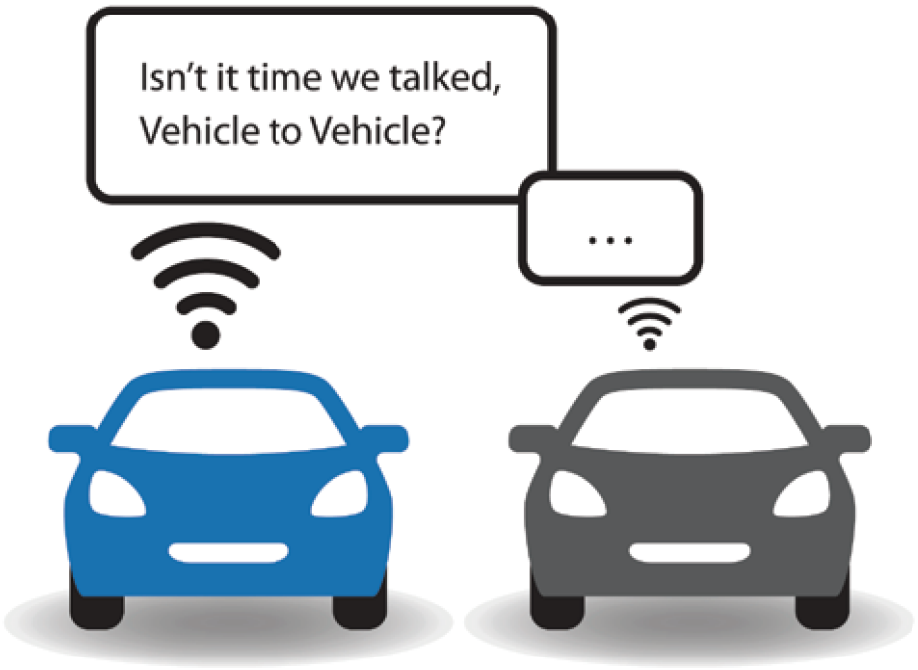

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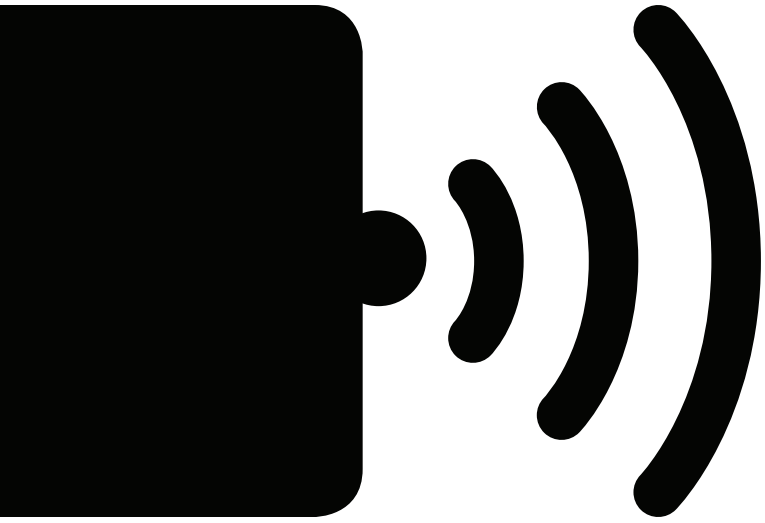

Getting Connected

By Pete Goldin

Connected vehicle technology is considered by many to be the future of ITS. Is it a smart investment, or can current technologies be better utilized?

The ITS industry is generating many varied innovations that will change the face of transportation, but the one that is expected to have the greatest impact on the future of ITS is connected vehicle technology. This involves Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication, and it is not just a vision of the future. Government agencies, transportation research institutions, and automakers have been heavily involved in development of this technology for the last decade, and they are making real progress.

In August, a $14.9 million research contract was awarded to the Michigan Department of Transportation (MDOT) and the University of Michigan Transportation Research Institute (UMTRI) by the US Department of Transportation (USDOT). The grant will fund a pilot deployment of V2V and V2I safety applications in Ann Arbor, Michigan—the next step in connected vehicle research.

The pilot will begin on and nearby the University of Michigan campus in August 2012 and continue for one year, involving approximately 2,850 vehicles, all equipped with V2V and V2I devices.

Connected vehicle technology involves a wireless exchange of vehicle data such as position, speed and location. The objective is to warn drivers of potential dangers, to help them avoid crashes. The ultimate vision of the USDOT is that all vehicles on the road will communicate with each other in this way, supporting a next-generation safety system.

Currently, prototypes and tests of this technology utilize a dedicated spectrum at 5.9 GHz known as Dedicated Short-Range Communication (DSRC), a form of WiFi with a special protocol designated as 820.11p.

Safety First

"Connected vehicle technology is the next major vehicle safety advancement," says Scott Belcher, President and CEO of ITS America. "It is on par with seat belts, airbags and electronic stability control. NHTSA (National Highway Traffic Safety Administration) has estimated that this technology can reduce the number of non-impaired crashes by 81 percent. That is huge."

Belcher points out that in addition to saving lives, this would also have a huge economic impact, adding, "The cost to our economy due to these kinds of crashes is in the hundreds of billions of dollars every year."

Other safety technologies have been deployed on vehicles before, but what makes connected vehicle technology so attractive is the use of DSRC, which has made the applications very cost-effective.

"At Ford, we already have radars that can sense other vehicles, and we are installing cameras that can see roadway markings, but this is expensive technology," explains Mike Shulman, Technical Leader, Ford Research, Ford Product Development. "We see vehicle communication as a very low-cost technology that we can put on all vehicles, not just luxury models, and provide a 360 degree awareness of what is going on outside the vehicle. This technology can prevent a variety of crashes, including crashes at intersections, which we cannot really address in any other way."

Reduced congestion and greenhouse gas emissions are also seen as valuable results that connected vehicle technology can deliver, but the US is currently focusing on the safety aspect, with expectations that the communication devices can be leveraged for the other benefits once they are widely deployed.

> "Connected vehicle technology is the next major vehicle safety advancement. It is on par with seat belts, airbags and electronic stability control." — *SCOTT BELCHER, PRESIDENT AND CEO OF ITS AMERICA*

Interfacing with Drivers

The Ann Arbor pilot in 2012 is actually the second phase of a two-part Connected Vehicle Safety Pilot. The first phase, happening right now, is a series of driver acceptance clinics held by the USDOT in six cities across America. While the Ann Arbor pilot will test the viability of the DSRC technology, and the ability of vehicles to send and receive the messages, the clinics are testing the motorist's ability to "get the message."

"The clinics take place in a controlled environment, such as a vacant racetrack, in a variety of locations around the US," says Gregory D. Winfree, acting administrator, Research and Innovative Technology Administration, USDOT. "They are designed to assess how everyday drivers will react to in-vehicle alerts and warnings."

He adds, "During the first driver clinic in Brooklyn, Michigan, the safety applications were very well received, with several drivers commenting that they see some clear safety benefits to the technology."

Much research has gone into determining the best way to interface with the driver. Shulman from Ford explains that the messages do not use vocal or text messages because these would not translate across multiple cultures. Instead they use warning lights and tones to get the driver's attention.

"Decisions need to be made on the interface between the vehicle and the driver," notes Steve Cook, Engineer of Maintenance and Operations, MDOT. "How that would actually be done, so that we minimize distraction to the driver, still has to be studied."

"Our first goal is to get the driver to look around and brake," Shulman explains. "We want the driver to see that something is happening up ahead. So far in our testing that has worked really well. People seem to understand it."

Even when a car may be braking hard in front of a truck, the warning would cause the driver behind the truck to be more alert to deal with the situation, which would happen seconds later when the truck starts to brake. In this way, the technology can provide a warning to a dangerous situation that the driver would otherwise never be aware of. It is these use cases that highlight the life-saving value of connected vehicle applications.

A Private Matter

One of the most significant issues, when it comes to public acceptance of connected vehicle technology, is privacy.

"You're hitting a very touchy area when you start talking about privacy," says Cook. "Privacy is one of those issues that we have to overcome."

"Privacy is an issue that is important but manageable," Belcher clarifies. "If you think about the information you provide right now with your credit card, smartphone or GPS device, you are giving away information about your whereabouts already."

> "In the US, I don't think people are amenable to giving over control of their vehicle to a computer, and I am not sure, given our liability culture in this country, that is likely to happen anytime soon." — *SCOTT BELCHER*

"The vehicle sends out a message with the position and speed, but it does not send out the VIN number, license plate, or anything about the driver," Shulman adds, pointing out that the privacy issue is largely a misperception, and the general public will have to be educated to understand that this technology will not be used to track individuals.

In addition, Belcher suggests that fears could be minimized by establishing rigid privacy protocols, similar to the tolling industry. But he also suspects the privacy issue will become less of a flashpoint as a new generation of drivers, who are not as concerned with privacy, becomes the majority.

The issue that may become more of a hindrance in the long term is vehicle control. Providing warnings to drivers is seen by some as a first step, with vehicle control as a possible next step. However, when connected vehicle technology starts to take control of vehicles, even for such a beneficent reason as avoiding collisions, this is a totally new concept that the public may resist.

"Regarding active safety features that could actually control a vehicle, there is still a lot of decision-making going on with the USDOT and automakers on how to handle that," says Cook.

"The issue of people not wanting to give up control is an important one," Belcher adds. "In the US, I don't think people are amenable to giving over control of their vehicle to a computer, and I am not sure, given our liability culture in this country, that is likely to happen anytime soon."

"I think it's going to be 10 years before we see any active safety applications deployed in vehicles," Cook concurs.

Fitting in with ITS

Another important challenge is fitting connected vehicle technology in with broader ITS systems.

"ITS technologies such as detection fit well with the connected vehicle environment," Belcher assures. "Integrated traffic systems are the baseline for ITS already. Connected vehicle technology is the next major advancement in synchronized traffic signals because it delivers continuous real-time data."

"I think eventually the connected vehicle will take over where some ITS technology is now," Cook predicts. "All the traffic information on VMS, traffic signals and signs will pop up right on your dashboard."

But should the USDOT be spending money on future ITS technologies when many would say we are not making the most of the intelligent transportation systems we have right now?

"I think there should be greater emphasis on deploying the technology that we have," Belcher agrees. "There is a lot of very good technology that can help local governments deal with the transportation problems now, but they simply do not have the resources to do it. USDOT's RITA is a research organization, not a deployment organization, and they are putting most of their money into research about connected vehicles and the future of ITS—and that makes a lot of sense, and I understand that completely. But it is not an either-or discussion."

"While I feel strongly that we need to invest more in deployment of the technology that is available, I don't think that necessarily means at the expense of continued research," he adds.

Connected Vehicles in the Real World

Out on the world's real roadways, connected vehicle technology will have no value unless the vehicles can actually understand each other. The key to making connected vehicle technology work is to standardize messaging and protocols across as many vehicle manufacturers and geographic regions as possible.

Shulman from Ford serves as the program manager for the Crash Avoidance Metrics Partnership (CAMP), a research consortium of automobile manufacturers working together to develop standards for connected vehicle technology. CAMP—which includes Ford Motor, General Motors, Honda, Hyundai, Kia, Mercedes-Benz, Nissan, Toyota and Volkswagen—is funded by NHTSA and other government agencies, as well as the automakers. Each company in the consortium is providing eight vehicles to the Ann Arbor pilot.

> "While I feel strongly that we need to invest more in deployment of the technology that is available, I don't think that necessarily means at the expense of continued research." — *SCOTT BELCHER*

"When completed, the pilot will demonstrate first-hand how connected vehicles communicate in the real world, bringing us a step closer to what could be the next major safety breakthrough," says NHTSA Administrator David Strickland.

> "... when we tell people we are going to bring wireless to cars, they say: it is about time—what have you been waiting for?" — *MIKE SHULMAN, TECHNICAL LEADER, FORD RESEARCH, FORD PRODUCT DEVELOPMENT*

The next steps in the evolution of connected vehicle technology have already been mapped out. After the Ann Arbor test is completed in 2013, NHTSA will make a decision whether to establish a regulation requiring the technology on all new vehicles, similar to recent mandates for stability control and rear visibility cameras.

Even if NHTSA mandates the technology, however, one of the primary challenges to real world implementation of connected vehicle technology is the vehicles already on the road. Even if all new vehicles have the technology installed, that still leaves many vehicles without the ability to communicate. Consequently, the USDOT is also funding research into the development of aftermarket devices that can be deployed on vehicles to enable V2V and V2I communication.

But this further complicates the eventual dilemma of deciding who pays for the deployment of this technology. The extra cost to the vehicle, whether OEM or aftermarket, is expected to be relatively low, but the question about who will get the bill has not been answered yet.

"We have to decide who is going to implement the infrastructure, who is going to maintain and operate it, and when the vehicles will get these devices installed," Cook adds. "The USDOT and AASHTO are trying to decide who is going to have the responsibility. There are a lot of decisions that have to be made."

Regardless of these details, however, the industry is forging ahead with this revolutionary technology.

"We are living in a wireless world," Shulman concludes, "and when we tell people we are going to bring wireless to cars, they say: it is about time—what have you been waiting for? This is something revolutionary, but also for most people it will be something that they have expected for a long time. Most importantly, we think it is something that should be available to everyone because it can really save lives." ■

Pete Goldin is a freelance journalist specializing in transportation and technology. He has written for magazines such as ITS International, World Highways, Parking World and the ITS Daily News at the ITS World Congress. Mr. Goldin can be reached at petegoldin@gmail.com.

Counterpoint

Running Before You Can Walk

By Brian Hagen

Texas Transportation Institute's 2011 Urban Mobility report says it best: in 2010, US drivers wasted 4.8 billion hours stuck in traffic, equivalent to nearly one full work week per commuter. Wavetronix agrees that congestion is a constant and growing problem, but we believe it is too easy to ignore solutions at hand in pursuit of the Next Big Thing.

At the moment, the Next Big Thing appears to be connected vehicle technologies. V2V and V2I are certainly appealing—the promise of improved safety and efficiency from intelligent vehicles operating in an interconnected environment seems clear. But is it practical, and will it really improve upon the solutions already available?

To be successful, connected vehicle technologies will require adoption densities that will take years to accomplish. Current projections say V2V will not reach practical deployment density until 2020. This estimate is based on the successful adoption of as-yet undefined standards and protocols, so in reality, this target date may be overly optimistic.

The challenges to V2I are even more daunting. Implementing a ubiquitous V2I wireless communication system in an average city introduces stratospheric costs and unknown security issues. An effective V2I system will require uncompromised, real-time data processing between countless network devices on a scale that will dictate the implementation timeline for decades to come.

Which begs the question, are we taking full advantage of the ITS technologies available to us today? Most US cities have yet to fully implement the technologies they have already deployed, so our 20-year old ITS infrastructure has yet to reach its full potential.

Wavetronix agrees with the TTI Urban Mobility Report: "Get as much service as possible from what we have ... many low-cost improvements have broad public support and can be rapidly deployed. These management programs require innovation, constant attention and adjustment, but they pay dividends in faster, safer and more reliable travel."

It may be wise to pursue connected vehicle technologies as a solution to ever increasing traffic congestion, but Wavetronix believes it is foolish to do so at the expense of the road-ready, proven, cost-effective technologies available today. ■

Brian Hagen serves as COO at Wavetronix.