Motor Age

ADVANCING THE AUTOMOTIVE SERVICE PROFESSIONAL SINCE 1899

COMMITMENT TO TRAINING
SIX TIPS TO HELP YOUR SHOP GENERATE MORE REPEAT BUSINESS 22

UBM

JULY 2018
VOL. 137, NO. 7 // MOTORAGE.COM

ALSO INSIDE: A LOOK AT J2534

CONNECTED VERSUS "CONNECTED" VEHICLE

The term "connected vehicle" covers a number of topics. Let's try to make sense of them all!

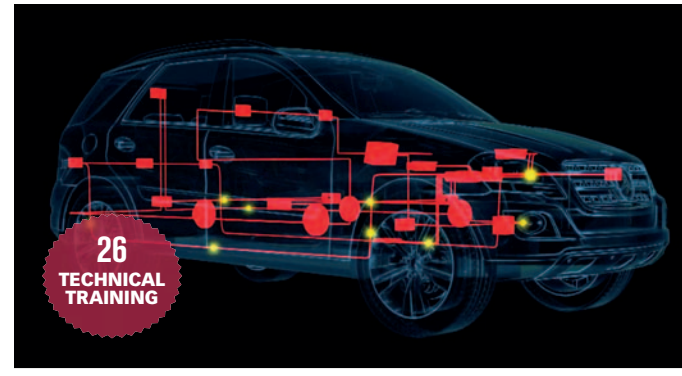
THE TRAINER:
DEALING WITH TRANSMISSION CONCERNS

Motor Age®
ADVANCING THE AUTOMOTIVE SERVICE PROFESSIONAL SINCE 1899

Talk Shop Anytime

JULY 2018
VOL. 137, NO. 7 // MOTORAGE.COM

OPERATIONS



TECHNICAL

CONNECTED VERSUS "CONNECTED" VEHICLE

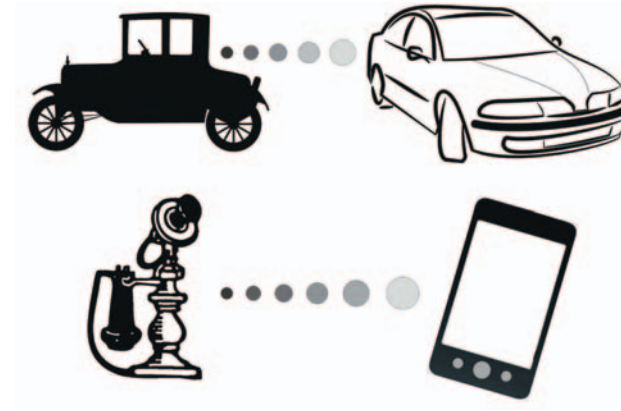
THE TERM "CONNECTED" VEHICLE COVERS A NUMBER OF TOPICS. LET'S TRY TO MAKE SENSE OF THEM ALL!

TRACY MARTIN // Contributing Editor

A little over 100 years ago (1908 to be exact) Henry Ford's original Model T was on the road, and by 1913 they were rolling off the first moving assembly line. In 1925, Ford was producing a vehicle every 10 seconds that cost $290, down from $850 in 1908. In 1920, 9 million automobiles were registered in the U.S. and by 1929 that figure had risen to 26 million. This rapid adoption and expansion of automotive technology is similar to the way telephones have evolved. In 1881 there were 49,000 telephones; fast-forward to 1980 when 175 million telephones were in use in the U.S. In 2000, the Ericsson R380 was the first widely used mobile phone and it started the transition from land-line based phones to smartphones. Early smartphones were limited in capabilities and relatively expensive when compared to today's offerings. In 2010, 62 million people were using smartphones in the U.S. and in 2018 that number reached 237 million.

In the past, telephone and automobile technologies did not appear to have much in common, but today the automotive industry is entering a phase of significant innovation similar in scope to the popularization of the automobile as a personal transportation "device" a century ago. Over the next 10 years, automobiles will morph into rolling smartphones that can access, consume and create information. Cars will share this data with drivers, passengers, public infrastructure and other vehicles. The predicted benefits are vast and could include a reduction in accident rates, lower emissions, shorter driving times improving productivity and on-demand, in-vehicle entertainment.

Vehicle connectivity generally comprises functions and capabilities that wirelessly link automobiles to smartphones, services and other vehicles. As such, a Connected Vehicle (CV) generally refers to one that is equipped with technologies and services that transmit and receive data via a wireless internet connection. The Society of Automotive Engineers (SAE) International has anticipated connectivity and automated driving being deployed along a continuum of functionality and has developed a scale to describe it. In late 2016, the National Highway Traffic Safety Administration (NHTSA) adopted the SAE definition.



100 YEARS AGO CARS AND TELEPHONES DID NOT HAVE MUCH IN COMMON. Today automobiles and smartphones are morphing into something new — the connected car.

The SAE definition divides vehicles into six levels based on "Who Does What, When." In general:

- At SAE Level 0, the human driver does everything
- At SAE Level 1, an automated system on the vehicle can sometimes assist the human driver to conduct some parts of the driving task
- At SAE Level 2, an automated system on the vehicle can actually conduct some parts of the driving task, while the human continues to monitor the driving environment and performs the rest of the driving tasks
- At SAE Level 3, an automated system can both actually conduct some parts of the driving task and monitor the driving environment in some instances, but the human driver must be ready to take back control when the automated system requests
- At SAE Level 4, an automated system can conduct the driving task and monitor the driving environment, and the human need not take back control, but the automated sys-

PHOTOS: TRACY MARTIN

tem can operate only in certain environments and under certain conditions

- At SAE Level 5, the automated system can perform all driving tasks, under all conditions that a human driver could perform them

Is data generated from connected vehicles private?

In 2014, Senator Edward J. Markey (D-Mass) released a report called "Tracking & Hacking: Security & Privacy Gaps Put American Drivers at Risk." The report details how 16 major automobile manufacturers responded to questions about how vehicles may be vulnerable to hackers, and how driver information is collected and protected. The responses from the OEMs indicated that many of their vehicles have fully adopted wireless technologies, like Bluetooth and wireless internet access, but have not addressed the real possibilities of hackers infiltrating vehicle information. The report also detailed the widespread collection of driver and vehicle information, without privacy protections regarding how that information is shared and used. "We need to work with the industry and cyber-security experts to establish clear rules of the road to ensure the safety and privacy of 21st-century American drivers," said Senator Markey. For CV technology to function safely, data communicated between vehicles and the infrastructure must be secure.

Most consumers recognize that if cars are connected to operate safely on the road that literally everything that takes place with, or in a vehicle will be captured digitally. Connected technologies will make possible safer, more convenient and entertaining cars but will also amass vast amounts of personal information about drivers. The temptation to track and profile potential customers will be hard to resist by advertisers who are willing to pay for this information.

For example, a driver receives an email form work while driving to the local

FOR A CONNECTED VEHICLE INFRASTRUCTURE TO WORK VEHICLES will be connected to each other and to traffic lights, intersections, bridges, toll booths, Interstate highways and railroad crossings. Both V2V and V2i types of wireless connections will be necessary to provide vehicle 360-awareness on the highways of the future.

Starbucks. Upon arrival they order a latte from the app on their phone. Work-related communications and credit card information instantly enter and exit the car's computer and is broadcast over the internet where it is hopefully used only by Starbucks and the credit card company.

Depending upon the technology employed, ownership rights to data, and its protection as it passes through or is stored in a CV, implicate issues of personal privacy, corporate proprietary information and data security. These issues effect all connected vehicles that are "connected" in two different ways. The first includes infotainment, health monitoring, navigation, seeing who is ringing your door bell, having your refrigerator tell you that you need to buy milk — basically using the car as a smartphone. The other category is traffic infrastructure.

Traffic infrastructure

Many high-end cars use radar, Light

Detection and Ranging (Lidar), cameras and proximity sensors to warn drivers of the presence of other vehicles. While these systems work well for line-of-sight scenarios they do not offer the same "situational awareness" as a truly connected vehicle. A vehicle that is connected to traffic infrastructure would have a far greater sensory range than that of cars with on-board equipment only. A connected vehicle can receive alerts of hazardous situations, providing more time to react and/or alert the driver of impending doom. For example, if a vehicle is braking rapidly on the other side of a hill, out of sight of following vehicles, an alert would be sent as well as commands to the following car's braking and throttle controls to reduce speed. Other examples include a driver about to run a red light as they are nearing an intersection; an oncoming car in the wrong lane in a blind curve and vehicles swerving to avoid a road obstruction — the possibilities for accident avoidance are endless.

Another aspect of CV technology is that it will be less expensive to install per vehicle than radar, Lidar, cameras and sensor-driven on-board systems. A connected vehicle will only need to receive data from the surrounding infrastructure, display driver alerts and interact with on-board braking and engine management systems. Ultimately this technology will become standard equipment on most vehicles.

Currently the U.S. Department of Transportation (USDOT) has a CV program that is working with state and local transportation agencies, vehicle and device manufacturers and the public to test and evaluate technology that will enable cars, buses, trucks, trains, emergency vehicles, roads, smartphones and other infrastructure to "talk" to each other. Vehicles driven on the highway would use short-range radio signals for vehicle-to-vehicle (V2V) communications and roadside radio repeaters for longer range communications with the overall traffic infrastructure.

Traffic infrastructure

Connected vehicle technology will enable roads, bridges, railroad crossings, traffic lights, stop signs, toll booths, school zones, other infrastructure and smartphones to communicate and share vital transportation data. A networking technology known as Dedicated Short-Range Communications (DSRC) which is similar to WiFi, will be the primary means of sending and receiving information. Many vehicles today are already connected through cellular technology however, DSRC offers fast, secure, and reliable communications that is resistant to interference. Through the use of DSRC, GPS, cellular, Bluetooth and other communications technology, vehicles will attain 360-degree awareness of nearby vehicles and traffic infrastructure. V2V technology will continually transmit a vehicle's position, direction and speed as well as other information to other nearby vehicles.

Vehicle-to-Infrastructure (V2I) technology specifically provides communications between vehicles and traffic infrastructure and is a major step toward Intelligent Transportation Systems (ITS). Capturing vehicle-generated traffic data, V2I provides drivers with safety, mobility and other traffic-related issues and conditions. State and local municipalities are installing V2I infrastructure integrated with existing ITS equipment. Las Vegas is where Audi chose to be the first manufacturer to launch V2I technology in the U.S. Audi's 2017/2018 A4 and Q7 models that have the Audi connect PRIME option will be able to communicate with this infrastructure. The vehicles receive real-time traffic signal information from the advanced traffic

APPLE'S CARPLAY USES THE VEHICLE'S IN-DASH DISPLAY to provide a more driver-friendly, less distracting interface than a typical iPhone screen.

management system that monitors traffic lights via an on-board, 4G LTE data connection.

When approaching a connected traffic light, the connect PRIME feature, Traffic Light Information, displays the time remaining until the traffic signal changes on the vehicle's instrument cluster as well as the head-up-display. This information reduces driver stress by informing them approximately how much time remains before the light changes from red to green. While the time-to-green feature is a fist for Audi, in the future it may be possible to integrate additional information from advanced traffic management systems including: vehicle start/stop features, navigation systems to optimize routing and predictive services that could present the driver with speed recommendations designed to maximize the number of green lights that can be made in sequence. These types of services would improve traffic management by reducing driving time.

V2V and V2I technology relies on large numbers of vehicles, roadways, intersections and other traffic infrastructure to be intelligently connected. Audi estimates that more than 1,600 intersections in the U.S. support their Traffic Light Information feature. The system is currently active in Las Vegas, Wash-

ington D.C., Dallas, Houston, Denver, Portland and Palo Alto California.

Four-wheel smartphones?

With connected and autonomous vehicles at the forefront of automotive technology, the automotive industry, computer hardware and software companies are seeing dollar signs and are willing to collaborate if the result is winning over tech-savvy consumers bent on migrating their smartphone-driven existence into the automobiles they drive.

Automobile information displays have come a long way from the first digital dashboard like the 1978 Cadillac Seville and Chrysler's vacuum florescent display on their Imperial, New Yorker and Fifth Avenue models in the early 1990s. Many of these early displays include a speedometer, trip computer, outdoor temperature and travel direction compass.

While digital displays in cars have certainly improved, they have a tough time competing with technology that most drivers carry in their purse or pocket — the smartphone. Auto manufacturers often have five, or even 10-year production cycles and no matter how advanced their digital display technology is, it is going to look out of date before the model receives it first facelift. OEM on-board display technology is a tough sell to consumers on the showroom floor when the smartphone in their pocket has a better display, more features and costs under $900 dollars.

Both Apple and Google are determined to be entrenched in the CV marketplace with their apps CarPlay and Android Auto. Powered by a smartphone, these platforms interface with a vehicle's built-in display. The resulting interface will always have an up-to-date look because it's not hard-wired into the car. However they don't merely use the vehicle's display as a screen for a smartphone, but instead are voice-centric in that they rely on voice commands and are designed to be less distracting than viewing a smartphone screen.

When a smartphone is plugged in, the car's onboard system display is controlled by the Apple or Android app. Technology that integrates these smartphone apps with automotive systems can be found on numerous brands and models of vehicles.

Apple CarPlay

Powered by an iPhone, CarPlay provides a vehicle with an interface that looks like Apple's iOS, but is simplified so it can be safely and legally used while driving. For example, incoming iMessages and WhatsApp messages are spoken by Siri instead of just shown on the display. CarPlay is designed to remove the urge for the user to take a quick look at their iPhone while behind the wheel. The CarPlay app displays the iPhone's interface on the car's dashboard infotainment screen, complete with app icons and a virtual "home" button.

Most vehicles that work with CarPlay require a connection to the phone via a USB port with a Lightning cable, but some newer models (BMW 5-Series) support a wireless connection to CarPlay via the car's Bluetooth.

Currently, there are more than 300 models of automobiles that work with CarPlay either as standard equipment or as an option. Some cars bundle CarPlay with an enhanced sound system or a higher level of cabin trim. The cost for a CarPlay capable vehicle varies. For example, Honda includes CarPlay as standard equipment on some models, but Ford charges around $1,000 for it to work with Ford's Sync 3 system.

Android Auto

For drivers who don't use Apple products, Android Auto is an alternative to CarPlay. Android Auto allows Google smartphone users to display Google

THE ANDROID AUTO APP INTERFACES with the vehicle's on-board display using the OEM steering wheel controls, touch screen and voice commands.

A CONNECTED CAR PROVIDES the means for tech-savvy consumers to migrate their smartphone-driven existence into the automobiles they drive.

Maps, the gold standard in navigation for the last 10 years. Using Android Auto, the in-dash display of Google Maps goes beyond mere navigation as apps for making phone calls, playing music and sending text messages are all part of the experience. For driving safety, Android Auto provides safe access to everything that's important on a typical smartphone and nothing more. There are some limitations as only Google-approved apps with the necessary driver-safety measures in place can take advantage of the Android Auto user interface. Android Auto interfaces with a vehicle's infotainment display via USB but does not mirror the phone's screen. The vehicle's touch screen, steering wheel controls, buttons and control knobs remain functional. Audio is sent via USB for music with no

loss in sound quality, unlike with Bluetooth audio streaming, and phone calls are handled via Bluetooth hands-free.

Forty automakers are selling new cars world-wide that are compatible with Android Auto. Currently over 400 models offer Android Auto compatibly with more added each year. An update to the Android Auto phone app is available that enables the full Android Auto experience right on the phone itself without needing to be plugged into a compatible car.

Using a dash or windshield-mounted cradle, the Android Auto app is displayed on a smartphone for navigation and infotainment without relying on the in-dash display. Some Google-approved apps offer a heads-up display by laying the phone flat on the dashboard where it projects information on the windshield. This is a practical solution for vehicles that don't offer Android support. Like the in-dash Android Auto experience, the on-phone user interface is simplified and voice-centric, keeping driver distraction to a minimum.

Conclusion

The wide-spread adaption of digital connectivity for vehicles with or without driver assist features are just a precursor to fully autonomous cars, which by design would have to be connected with each other and just about everything else.

With the introduction of airbags and anti-lock brakes, many lives were saved and injuries reduced or eliminated. Connected vehicles can make similar reductions in the number of fatalities and serious injuries caused by accidents by preventing them from happening in the first place. This technology, with its advanced communications data, will also lessen or prevent traffic congestion and will have a significant impact on reducing fuel consumption and vehicle emissions. User interfaces like Android Auto and Apple CarPlay will also contribute to the overall safety of drivers and passengers alike as these apps will keep drivers focused on the road, instead of their smartphones.

Driving a connected car in the near future will be like playing a video game except that no one has to actually "play" to receive the benefits of this technology. The "game" will operate in the background reducing the critical decision workload for the driver; communicate with other vehicles and traffic infrastructure. The benefits of connected vehicle technology will ultimately be a safer, less stressful and more entertaining driving experience.

TRACY MARTIN has covered the powersports industries since 1998. He is also the author of six Motorbooks Workshop Series books published by the Quarto Publishing Group and is a regular contributor for *Motor Age*.
tracy.martin@yahoo.com