FPF
FUTURE OF PRIVACY FORUM

The Connected Car and Privacy
Navigating New Data Issues

THE CONNECTED CAR AND PRIVACY
NAVIGATING NEW DATA ISSUES

November 13, 2014

ABSTRACT

New technologies in vehicles promise drivers real advances in safety and convenience, but will only be welcomed by consumers if they can be sure their personal data will be handled in a trustworthy manner. Privacy principles adopted by leading auto makers set a responsible course for new uses of biometric, behavioral and location data and should help avoid any privacy bumps in the road.

This brief paper seeks to provide an overview of the technologies currently available in cars and identifies the types of data collected and the purposes for which it is used. We then turn to identify the new types of data collection that are now or soon to be available and identify common uses of that data. Our goal is to help inform media, policymakers, advocates and others about the vehicle data environment and help identify privacy issues that are relevant.

INTRODUCTION

The use of computers and data by automobiles is nothing new. Computerized systems began appearing in cars as early as 1969, and standardization of on-board diagnostics (OBD) in the 1990s further facilitated the collection of data within cars.[1] But the installation of more computer chips and electronics components have helped introduce new technologies that are significantly increasing the data volume produced by a car. According to an estimate by Industry Solutions Automotive & Mobility, new information about vehicle usage, wear and tear, or defects will grow from approximately 4 megabytes to over 5 gigabytes of data per vehicle per month.[2]

This white paper surveys the collection of data inside the vehicle ecosystem and explores how connectivity and the "connected car" augment or change how that information is collected and eventually used. In many cases, connectivity may serve to augment existing in-car technologies such as Event Data Recorders (EDRs) and OBD-II standards, but connectivity also directly expands the data collection capabilities of a car. However, auto manufacturers are already working to set up new rules of the road to ensure the connected car promotes a better driving experience, as well as consumer privacy.[3]

CURRENT TECHNOLOGIES

Even as automotive connectivity becomes commonplace, computerized in-vehicle systems already generate and use data about vehicle operations. For example, Event Data Recorders (EDRs) and On-Board Diagnostic (OBD) systems record information on the performance of various vehicle systems, while insurance companies have developed Use-Based Insurance applications that are built to harness the data available from OBD systems to provide insurers with information on how a vehicle is driven, provided drivers install a separate telematics device in their car.

EVENT DATA RECORDERS

Event Data Recorders are devices which record a brief snapshot of information related to an "event," typically a vehicle crash or near-crash. EDRs installed in motor vehicles record vehicle system

[1] Automotive IQ, Automotive Diagnostic Systems: History of OBD (Jun. 8, 2011), http://automotiveiq.wordpress.com/2011/06/08/automotive-diagnostic-systems-history-of-obd/.

[2] Deutsche Telekom, Connected Cars Get Big Data Rolling, http://www.telekom.com/media/media-kits/179806 (last visited Oct. 1, 2014).

[3] Comments of the Association of Global Automakers, Re: Docket No. NHTSA-2014-0022 ANPR on Vehicle-to-Vehicle Communications, at 4-5 (Oct. 20, 2014), http://www.globalautomakers.org/sites/default/files/document/attachments/V2V%20ANPRM%20Comment_Final_20OCT2014.pdf.

information as well as some occupant information (e.g., seat belt use) for a brief period of time before, during, and after a crash. EDRs record a several-second snapshot of (1) pre-crash vehicle dynamics and system status, such as vehicle speed, (2) driver inputs like steering and breaking, (3) seatbelt usage and airbag deployment, and (4) post-crash data such as the activation of an automatic collision notification system.[4] The data is not remotely transmitted outside the car and is not retrieved by car manufacturers without the car owner's consent. Most EDRs in automobiles and light trucks are part of the restraint system control module, which senses impact accelerations and determines what restraints (airbags and/or seatbelt tensioners) to deploy.

As the National Highway Traffic Safety Administration explained in its proposed rule requiring EDRs, automotive EDRs do not record audio or video, and do not capture vehicle location information.

Unlike the more familiar black boxes found in airplanes, automotive EDRs do not record audio, video, or location information. The data recorded from an EDR must be directly accessed by a technician, and requires physical access to a vehicle. Technicians connect the appropriate scanning tool to the vehicle's Diagnostic Link Connector, which is usually found under the vehicle's dashboard. While there has been some debate about the use of data collected by EDRs, states have moved quickly to clarify the owner's control over this information. Fourteen states have enacted laws that restrict access to EDRs and with some exceptions, require that any data collected from an EDR can only be downloaded with the consent of the vehicle's owner.[5]

EDRs have been available in cars since the 1990s, and are now a regular feature in today's vehicles. According to industry estimates, 96% of new cars sold in the United States already have EDRs, and a National Highway Traffic Safety Administration regulation aims to make EDRs a mandatory requirement.[6]

On-Board Diagnostics

On-board diagnostics, or "OBD," have existed in cars in some form for years. Modern computer-based OBD systems have been built into all 1996 and later light-duty vehicles and trucks, as required by the Clean Air Act Amendments of 1990. They were designed to monitor the performance of some of an engine's major components, including

[4] National Highway Traffic Safety Administration, EDR Q&As (Aug. 2006), available at http://www.nhtsa.gov/DOT/NHTSA/Rulemaking/Rules/Associated%20Files/EDR_QAs_11Aug2006.pdf.

[5] National Conference of State Legislatures, Privacy of Data from Event Data Recorders: State Statutes, http://www.ncsl.org/research/telecommunications-and-information-technology/privacy-of-data-from-event-data-recorders.aspx (last updated June 23, 2014).

[6] Jim Motavalli, Safety Agency Proposing Mandatory Event Data Recorders, Wheels (Dec. 7, 2012), http://wheels.blogs.nytimes.com/2012/12/07/safety-agency-proposing-mandatory-event-data-recorders/.

those responsible for controlling emissions. But the system also provides owners with an early warning of malfunctions by way of a dashboard "Check Engine" light. By giving vehicle owners this early warning, OBD protects not only the environment but also consumers, identifying minor problems before they become major repairs.

OBD assists in the service and repair of vehicles by providing repair technicians with a simple, quick, and effective way to pinpoint problems by retrieving vital automobile diagnostics information from the OBD system. Technicians at repair shops or dealerships use scanning tools to read this information and to diagnose the cause of a vehicle's problem.

For state agencies, OBD plays an important role where vehicle emissions inspection and maintenance programs are required. For vehicle and engine manufacturers, OBD systems are required by the EPA to be installed on light-duty vehicles and trucks, as well as heavy-duty engines.

Use-Based Insurance

Insurance companies have for a number of years used access to OBD data to provide safe driver programs and personalized insurance rates, with the permission of drivers. To do so, the companies provide drivers with a device which can send them information about how a car is driven. Progressive's Snapshot, for example, is a dongle the plugs into a vehicle's OBD-II port in order to continually collect information about how the vehicle is driven.[7] Several other insurers provide similar telematics devices that can record information such as the amount the car is driven, when it is driven, and whether the driver is hard braking or accelerating quickly.[8] Some insurers simply use telematics devices to offer low mileage discounts to drivers who have their car in a garage more than on the road.[9] State insurance laws determine whether these sorts of telematics-based personalized insurance offerings are available and what sort of regulations govern how they work.[10]

State insurance laws regulate what sorts of telematics-based insurance offerings are available from safe driver programs to low mileage discounts.

[7] Progressive, Snapshot Privacy Statement, http://www.progressive.com/auto/snapshot-privacy-statement/ (last updated Mar. 11, 2014).
[8] National Association of Insurance Commissioners, Usage-Based Insurance and Telematics, http://www.naic.org/cipr_topics/topic_usage_based_insurance.htm (last updated July 18, 2014).
[9] Travelers IntelliDrive Program FAQ, https://www.travelers.com/personal-insurance/auto-insurance/discounts-advantages/low-mileage-discount/faq.aspx (last visited Oct. 1, 2014).
[10] Telematics Update, Insurance Telematics: US State Regulators Tackle UBI (June 12, 2012), http://analysis.telematicsupdate.com/insurance-telematics/insurance-telematics-us-state-regulators-tackle-ubi.

NEW TECHNOLOGIES TO SERVE DRIVERS: WHAT IS THE CONNECTED CAR?

The connected car refers to the use of in-car telematics, a range of technologies that leverage connectivity, whether over the Internet or via dedicated short-range communications (DSRC), with diagnostic, location, or other information to provide new safety, convenience, and communications services. Connectivity has the further potential to reduce traffic congestion, reducing both vehicle emissions and energy consumption. Some common telematics services already available in vehicles include crisis and crash assistance, destination information and guidance, emergency services, remote monitoring, and a variety of vehicle alerts, news, and infotainment.[11] The precise definition of the "connected car" is evolving rapidly as vehicles are outfitted with new technologies. According to the Department of Transportation, connectivity promises to allow an elaborate network of communications among vehicles, infrastructure, and any wireless device inside the vehicle.[12]

Connectivity leverages data collected both inside and outside of the car to provide a variety of new driving benefits, conveniences, and consumer applications. According to former Transportation Secretary Ray LaHood, connectivity offers tremendous promise for improving safety, reducing traffic congestion, and increasing fuel efficiency.[13]

Connected Car Services[14]	
Automatic Collision Notification	*Remote Horn and Lights*
Concierge Services	*Roadside Assistance*
Crisis Assistance	*Sports and News Information*
Dealer Service Contact	*Stock Information*
Destination Information and Guidance	*Stolen Vehicle Tracking*
Emergency Services	*Text Message Display*
Fuel/Price Finder	*Traffic Information*
Hands-Free Calling	*Vehicle Alarm Notification*
Local Search	*Vehicle Alerts and Diagnostics*
Location Sharing	*Vehicle Location*
Remote Door Lock and Unlock	*Weather Information*

[11] Edmunds, Telematics Chart, http://www.edmunds.com/car-technology/telematics.html (last visited Oct. 1, 2014).

[12] U.S. Department of Transportation, Research and Innovative Technology Administration, Connected Vehicle Research in the United States, http://www.its.dot.gov/connected_vehicle/connected_vehicle_research.htm (last updated June 26, 2014).

[13] Press Release, New DOT Research Shows Drivers Support Connected Vehicle Technology, Appreciate Potential Safety Benefits, National Highway Traffic Safety Administration (May 22, 2012), http://www.nhtsa.gov/About+NHTSA/Press+Releases/2012/New+DOT+Research+Shows+Drivers+Support+Connected+Vehicle+Technology,+Appreciate+Potential+Safety+Benefits.

[14] Edmunds, *supra* note 12.

Safety Features

Connectivity can take advantage of both location and diagnostic information to assist in emergency response. For example, the OnStar service provides automatic crash response, which allows an equipped-vehicle to alert emergency responders in the event of an accident, such as when an airbag deploys, and allows roadside assistance services to pinpoint the location of a car.[15] These sorts of features will become more commonplace in vehicles, but connectivity will also allow drivers to receive location-based warnings and information about weather emergencies or road conditions.

With connectivity, diagnostic and vehicle performance information generated by a car can be used by manufacturers, technicians, and drivers to get feedback about how vehicles are performing on the road. For the first time, this type of information can be sent to vehicle manufacturers who can chart vehicle performance in order to plan safety and performance improvements in the future, which could be immensely beneficial. Connectivity can also improve use-based insurance implementation, subject to state insurance laws. Instead of needing a separate device, consumers will be able to directly opt-in to use-based insurance by sharing information from the vehicle directly with insurance companies.

Environmental Benefits

In addition to safety benefits, connectivity will allow for continuous emissions testing of vehicles, which could reduce oil consumption by 4% nationwide, saving six billion gallons of gasoline.[16] Services like Automatic can monitor driver behavior, nudging drivers towards better and more fuel-efficient behaviors, and provide an interactive driving score.[17]

Optimizing traffic times will improve fuel-efficiency, and eventually, the ability of vehicles to communicate with traffic signals will help to eliminate unnecessary stops and allow drivers to operate their vehicles at optimal fuel-efficiency.[18] And at a macro level, city planners and transportation agencies will be able to use real-time traffic data and aggregated driver information to optimize traffic flows and even target roads most in need of repair.

[15] SOS Emergency, OnStar, https://www.onstar.com/web/portal/emergencyexplore?g=1 (last visited Oct. 1, 2014).

[16] The Connected Car, Verizon Telematics, https://verizontelematics.com/pp/whitepapers/emissionswp.php (last visited Oct. 1, 2014).

[17] Russell Brandom, Automatic's iPhone App Makes Your Dumb Car Feel a Little Smarter, The Verge (Mar. 12, 2013), http://www.theverge.com/2013/3/12/4091036/automatic-for-iphone-displays-car-mileage-location-crash-response.

[18] U.S. Department of Transportation, Research and Innovative Technology Administration, Connected Vehicle Research in the United States, Connected Vehicle Frequently Asked Questions, http://www.its.dot.gov/connected_vehicle/connected_vehicles_FAQs.htm (last updated June 26, 2014).

Convenience

Connectivity can also power a range of consumer applications to make driving more convenient and more fun. Other remote monitoring services let drivers know if they should engage their parking brake, get fuel, inflate their tires, or get an oil change just from looking at an app on their smartphone. Applications also allow drivers to remotely start their cars and beat the heat (or the cold) by setting the car's internal temperature without even going outside, and to find their vehicles via their mobile phone in a crowded mall parking lot.[19]

Separating Smart Cars from Smart Phones

Today, many of these features are powered by smart phones that are brought into the car. Smart phones often serve as the connectivity hub for the vehicle, but fully connected cars will increasingly provide connectivity in-car. Safety requires that new features be provided without creating driver distractions.[20] In-car features that allow drivers to access a wide range of infotainment and convenience services will need to be functional without forcing drivers to take their eyes off the road or encouraging them to divert their attention back to their smart phones.

What Data Can a Connected Car Collect?

While diagnostic information has long been gathered by in-car systems, connectivity allows cars to collect data from new information sources. Some of this information will come from new technologies and sensors, and the capacity for today's connected cars to collect data about the surrounding environment or driver behavior is limited. But communications among vehicles and surrounding road infrastructure will likely increase in the future. Some of the information in the connected car ecosystem, such as subscriber and registrant information, is "new" only in the sense that it is being gathered by automobile manufacturers for the first time.

Geolocation Information

Connectivity provides consumers with more and more opportunities to take advantage of location-based services in their cars and real-time traffic-based navigation. In-car location-based services have long existed through personal GPS units and navigation apps in smartphones, but connected cars promise both to expand on these technologies and to

---

[19] BMW, Remote Services, http://www.bmw.com/com/en/insights/technology/connecteddrive/2013/services_apps/remote_services.html (last visited Oct. 1, 2014).

[20] Sonari Glinton, For Automakers, Internet-Connected Cars Are A Balancing Act, NPR (May 21, 2014), http://www.npr.org/blogs/alltechconsidered/2014/05/21/314604401/for-automakers-internet-connected-cars-are-a-balancing-act.

include more location-based services through telematics technologies embedded in the connected car itself.[21]

A vehicle's location can be determined through a variety of different methods, including cell tower signal-based technologies, Wi-Fi access points, crowd-sourced positioning, and GPS technology.[22] Currently, some combination of GPS and onboard sensors allows for connected cars to be aware of the vehicle's physical location.

External Information

Similarly, onboard sensors can also be used to gather information about the car's immediate surroundings, detecting lane markings and obstacles alike. Three key technologies that rely on this external environmental information are blind spot detection systems, lane-departure warnings, and rear-parking detection.[23]

Cameras and sensors can be arrayed in various positions around a vehicle to provide 360 degree electronic coverage of the car's surroundings.[24] For example, blind spot detection systems use ultrasonic or radar sensors on the side or rear of the vehicle to monitor traffic, while lane detection systems may use forward-facing cameras to identify lane markings. Parking detection systems can rely on both cameras and sensors that judge how close the vehicle is to nearby objects.[25] Pairing these different sensors and cameras together can provide sophisticated obstacle avoidance systems that portend the future of automated driving.[26]

Biometrics Information

In addition to external sensors, internal sensors that obtain information about the physical or biological characteristics and traits of a driver, or biometrics, will present opportunities for new vehicle features in the future such as providing access controls or driver identification. Biometric collection in cars involves collecting physical data such as facial recognition, vital signs, or voice samples. For example, voice recognition can be used to provide a

---

[21] Government Accountability Office, In-Car Location Based Services 4 (Dec. 2013), www.gao.gov/assets/660/659509.pdf.

[22] *Id.* at 10.

[23] Bill Howard, Blind Spot Detection: Car Tech That Watches Where You Can't, ExtremeTech (Sept. 5, 2013), http://www.extremetech.com/extreme/165742-blind-spot-detection-car-tech-that-watches-where-you-cant.

[24] *Id.*

[25] Munenori Hikita, An Introduction to Ultrasonic Sensors for Vehicle Parking, NewElectronics (May 12, 2010), http://www.newelectronics.co.uk/electronics-technology/an-introduction-to-ultrasonic-sensors-for-vehicle-parking/24966/; Press Release, See It, Hear It, Feel It: Ford Seeks Most Effective Driver Warnings for Active Safety Technology (2008), available at http://www.autofocusasia.com/press/pressrelease_archives.asp?PID=92.

[26] Press Release, Ford Test Car Makes North America Debut (Dec. 12, 2013), https://media.ford.com/content/fordmedia/fna/us/en/news/2013/12/12/ford-test-car-that-automatically-steers-around-stopped-or-slowin.html.

tailored, hands-free experience for using applications in a connected car.[27] Biometrics information could serve as powerful anti-theft protection, as well as providing increased safety and comfort inside the vehicle.

In the future, cars will be able to use internal cameras and sensors to automatically identify drivers. Vehicles will be able to quickly change car settings to accommodate different driving styles or driver profiles, such as for teenagers or the elderly.[28] Additional sensors will augment these capabilities by collecting additional biometric data.[29] Automakers are engaged in research on biometric data which can be collected in the car to provide real-time health monitoring for drivers. Conductive sensors in the steering wheel can monitor the driver's pulse and temperature. Sensors in the seatbelt can monitor breathing patterns.[30] This sort of biometric collection can provide a number of safety benefits for drivers with health conditions,[31] as well as help drivers monitor their stress and help prevent crashes.

Behavioral Information

In addition to gauging the physical characteristics of the driver, vehicles will also become better attuned at responding to driver behavior. In-car technologies can gather information about the driver's attention, speed, steering and braking habits and combine this with other diagnostic data to provide new safety features. For example, one automaker's "Attention Assist" feature gathers over seventy different parameters within minutes of starting a vehicle in order to help the vehicle detect signs of driver drowsiness.[32] It evaluates steering corrections along with other factors such as crosswinds, road surface quality, and how often the driver is engaging with the wheel to predict whether drivers are showing signs of fatigue, in which case it sounds an alert to the driver.

---

[27] Press Release, Nuance, ZTE unveil next-gen Car Voice Biometrics (Jan. 10, 2014), available at http://www.machinetomachinemagazine.com/2014/01/10/nuance-zte-unveil-next-gen-car-voice-biometrics/.

[28] Volkswagen, Biometric Driver Identification, http://www.volkswagenag.com/content/vwcorp/content/en/innovation/communication_and_networking/Biometric.html (last visited Oct. 1, 2014).

[29] Randolph Jonsson, Mitsubishi's Concept EMIRAI Driver Interface System, Gizmag (Dec. 11, 2011), http://www.gizmag.com/mitsubishi-concept-emirai-driver-interface-system/20801/.

[30] Mike Perlman, We Test Out Ford's Biometric Wellness Car Seat, TechnoBuffalo (July 3, 2012), http://www.technobuffalo.com/2012/07/03/we-test-out-fords-biometric-wellness-car-seat-video/;
Gene Ryan Briones, Auto Manufacturers Developing Cars With Biometric Sensors, Ubergizmo (Nov. 27, 2012), http://www.ubergizmo.com/2012/11/the-racing-to-develop-cars-with-biometric-sensors/.

[31] Yahoo! Small Business Advisor, Car Detects if Drivers Are Falling Asleep at the Wheel, Wakes Them Up (Aug. 27, 2014), https://smallbusiness.yahoo.com/advisor/car-detects-drivers-falling-asleep-wheel-wakes-them-091110654.html.

[32] Attention Assist, Mercedes-Benz, www.mbusa.com/mercedes/benz/safety#module-3 (last visited Oct. 1, 2014).

As stress and fatigue mounts, connected car safety systems could reduce driver distraction by automatically turning off the radio, blocking incoming cellphone calls, or bring the car to a stop in the event of a heart attack. Car makers and federal safety regulators are also working on in-vehicle systems that could reliably detect when someone is too drunk to drive.[33]

Subscriber & Registration Information

Many new telematics services will require user activation and on-going user accounts. Agreements to use these services will require personal information such as the user's name, address, and billing information to be collected from users. Some of this information may not have previously been collected by automakers. Because of the traditional relationship between vehicle manufacturers and car dealers, automakers generally lack a direct relationship with drivers. As a result, the collection of consumer subscriber information may involve a new set of data collection for automakers, even if subscriber or registration agreements are not a novel form of data.

Vehicle-to-Vehicle Communication

In the future, connected cars will expand their ability to sense, connect, and interact with the outside world, including other vehicles and their immediate environment. Dedicated short-range communications (DSRC) is a short-range automotive communication protocol used to facilitate this connectivity.[34] While standards are still being developed, DSRC can be used not just in vehicle-to-vehicle (V2V) communication but also vehicle-to-infrastructure (V2I) communication to establish ad hoc networks. Whenever any connected car comes into communications range with a smart stoplight, other intelligent infrastructure, or another vehicle with DSRC, they will be able to form a network.

This constant broadcast and reception of vehicle information gives connected cars a 360 degree awareness of their outside environment. Each vehicle connected to the network will know the position, speed, and direction of every other nearby vehicle.[35] Ultimately, V2V communications will enable vehicles to sense hazards on the road and issue warnings directly to drivers, allowing them to take actions to avoid or mitigate crashes.[36]

---

[33] Joseph B. White, A Car That Takes Your Pulse, Wall Street Journal (Nov. 28, 2012), http://online.wsj.com/news/articles/SB10001424127887324352004578131083891595840.

[34] Dedicated Short Range Communications, Clemson University Vehicular Electronics Laboratory, http://www.cvel.clemson.edu/auto/systems/dsrc.html (last visited Oct. 1, 2014). DSRC is a Wi-Fi-like system. *See, e.g.*, Lou Frenzel, M2M Connects Your Car To The World, Electronic Design (Mar. 10, 2014), http://electronicdesign.com/communications/m2m-connects-your-car-world.

[35] Car 2 Car Communication Consortium, https://www.car-2-car.org/index.php?id=8 (last visited Oct. 1, 2014).

[36] U.S. Department of Transportation, Research and Innovative Technology Administration, Vehicle-to-Vehicle (V2V) Communications for Safety www.its.dot.gov/research/v2v.htm (last visited Oct. 1, 2014).

According to a study by the National Highway Traffic Safety Administration (NHTSA), advance warnings through V2V could prevent up to 592,000 crashes and save 1,083 lives each year.[37] V2V communications are anonymous and do not contain any specific location data linked to the driver themselves; instead, the only information shared is the car's relative position in terms of other vehicles.[38]

This sort of external environmental information will eventually allow vehicles to cooperate with each other to ease traffic flow, protect pedestrians through DSRC-equipped smartphones, and help traffic agencies monitor and direct traffic flows. But DSRC can also be used to provide drivers with real-time monitoring of adverse weather conditions on the road. For example, cars that experience a loss of traction or begin hydroplaning can immediately send warnings to other cars in the area.[39]

The complexity of V2V and future V2I systems raise important privacy questions. However, NHTSA's recent V2V Report takes seriously the security and privacy concerns posed by V2V.[40] As the NHTSA begins to develop rules of the road around these technologies, it is working with numerous stakeholders to undertake a thorough privacy risk assessment, actions that have been endorsed by the Federal Trade Commission.[41]

Establishing Rules of the Road

Rules around much of this information collection are already being addressed, but the connected car will place many different parties and technologies behind the driver's seat. Onboard data collection in cars will raise privacy issues that, if not novel, are new to the auto industry. Any discussion of those privacy issues must recognize the many different types of information that connected cars may collect.

In addition to location and diagnostic data generally, connectivity splits the type of data in-car roughly in two. It will be important to distinguish between data collected and stored exclusively in the car, and accessible

---

[37] Press Release, U.S. Department of Transportation Issues Advance Notice of Proposed Rulemaking to Begin Implementation of Vehicle-to-Vehicle Communications Technology, National Highway Traffic Safety Administration (Aug. 18, 2014), http://www.nhtsa.gov/About+NHTSA/Press+Releases/NHTSA-issues-advanced-notice-of-proposed-rulemaking-on-V2V-communications

[38] Chris Davies, US to Mandate V2V Car-to-Car Communications for Safer Roads, Slash Gear (Feb. 3, 2014), http://www.slashgear.com/us-to-mandate-v2v-car-to-car-communications-for-safer-roads-03315580/.

[39] Clemson University Vehicular Electronics Laboratory, *supra* note 28.

[40] Nat'l Highway Traffic Safety Admin., Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application (2014) ("V2V Report"), *available at* http://www.nhtsa.gov/staticfiles/rulemaking/pdf/V2V/Readinessof-V2V-Technology-for-Application-812014.pdf.

[41] Comment of the Fed. Trade Comm'n, Docket No. NHTSA-2014-0022 (Oct. 20, 2014), http://www.ftc.gov/system/files/documents/advocacy_documents/federal-trade-commission-comment-national-highway-traffic-safety-administration-regarding-nhtsa/141020nhtsa-2014-0022.pdf.

only through a physical connection with the car, and data that is transmitted and potentially accessible by others. In many respects, that first category is nothing new. The latter category, however, will present the primary privacy challenges going forward. The manner in which data is used, shared, stored and protected will be essential to the wide embrace of connected cars and the data they collect. Similarly, understanding why data is collected and considering the safety, environmental, infotainment and consumer conveniences that are supported will be essential to future policy discussions.