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The Dispatcher

Special interest features covered in each issue:

- Autonomous and Self-driving Cars
- Big Data
- DSRC versus Wireless Communication
- Connected Vehicles – V2V and V2I
- Third party services for eCall

Individual Highlights:

In the next issue:

- Standardization: where it has helped and where it has hindered
- Personal data privacy
- Map data and telematics

Telematics Industry Insights by Michael L. Sena

How Do We Test Self-driving Cars?

My father, who was normally an extremely law-abiding citizen, started teaching me to drive when I was fourteen, two years before the legal age to have a learner's permit in Pennsylvania. Driving at such a young age is not so unusual for kids growing up on farms where they take the pick-up truck out for a spin before they even reach their teens, but I grew up in the middle of Scranton, the state's third largest city at the time. I guess Dad felt it was alright because we were not out driving on public streets or even in parking lots. We were driving on the abandoned, culm-covered roads crisscrossing the lands still owned by the mining companies. Not so long before, the anthracite coal, which was responsible for Scranton's existence and growth, ceased to be profitable to mine, but the roads that were used by mules and horses and finally trucks to haul gear and men were abundant. It was a perfect place to learn how to shift gears, accelerate, drive in reverse and start on a steep hill. Perfect!

Self-driving cars are a lot like pre-legal drivers. They need a safe place to learn the basics before we let them out on real roads, don't you think?

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UN Amends Convention on Road Traffic

Article 8 of the 1968 Vienna Convention on Road Traffic previously stated the following: "Every driver shall at all times be able to control his vehicle or to guide his animals." *The new rule, pushed forward by Germany, Italy, Austria, Belgium and France states:* "drivers of fully- or highly-autonomous cars would be permitted to remove their hands from the steering wheel, provided the system can be overridden or switched off". *The amendment must still pass through some bureaucratic obstacles, but if it is accepted, all 72 countries that have signed the Convention would have to incorporate the new rule into their respective laws. The US, China, Japan and Australia are not signatories of the Vienna Convention and have their own laws for ensuring safety on their roadways.*

Who Should Deliver Connected Services to Drivers? The Cybersecurity Dilemma

Car makers don't filter the radio programs delivered to the drivers of their cars. Why should they filter the services that are offered over the public Internet? I can call my chosen roadside assistance provider on my phone. Why can't I contact my chosen roadside assistance provider with the built-in telematics device I have in my car? Just a few years ago these were two very different questions. With today's IP-based service infrastructures, they have become one and the same.

Car makers have been caught on the horns of a dilemma. They have had to choose between maximizing the security of their on-board systems—minimizing the risks that they could be hacked—and providing the wide range of services that their customers expect to receive, first from wireless, location-sensitive devices and then from Internet-capable devices. Why is this a necessary choice? How many of you who are reading this have not had your computer infected by a virus? Before the Internet, viruses were spread on floppy disks. After the Internet, hackers could access any

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How Do We Test Self-driving Cars (Continued from P.1)

If you are receiving the weekly newsletter, ***Smart Driving Cars***, you will have read in the 21 July issue that Princeton Autonomous Vehicle Engineering (PAVE), under the direction of Dr. Alain L. Kornhauser, has created an automated vehicle research center to be located on a recently closed US Army base, Fort Monmouth, in the vicinity of Princeton University in New Jersey. PAVE will re-purpose existing office space and garage facilities 'to establish a demonstration technology municipality with automated vehicle technology and new forms of mobility as its priority'. The base is huge, containing 1,127 acres (456 hectares), and it functioned as a self-sufficient community with residences, shops, offices and garage and maintenance facilities for all types of vehicles. Most importantly, it contains a network of roads that don't just simulate all types of driving conditions. They are the real deal!

The Research Center for Automated Vehicles @ Fort Monmouth, as the center will be called, will be led by Dr. Jerome Lutin. Jerry, who was a classmate of mine in the Masters of Architecture and Urban Planning program at Princeton, went on to get his Ph.D. in Urban Planning at Princeton and served on the faculty in both the Architecture and Urban Planning and the Civil Engineering Schools. He became the Senior Director of Statewide and Regional Planning for the New Jersey Transit Corporation. He is Distinguished Research Professor at the New Jersey Institute of Technology. I will look forward to be working again with Jerry. I have been asked to take the lead in configuring the test facility for the different types of driving conditions that will be encountered, including the mix of all types of private, commercial and transit vehicles, pedestrians, cyclists, road repair and delivery situations.

There is a great deal of activity in the field of autonomous, self-driving, smart-driving or unmanned vehicle systems. All of these names apply and are used to identify on-going research, development and deployment work. At the *Automated Vehicles Symposium 2014*, held in mid-July in San Francisco, where the announcement of the Fort Monmouth center was made, close to six hundred participants gathered to discuss where we are and where we are heading. Among the sponsors for the event were automotive suppliers *Continental, Denso, Magna Electronics* and *Bosch*, map supplier *Here*, and insurance company *Travelers*. Tests have been performed in private by Google around its facilities, by the vehicle OEMs and equipment suppliers on their test sites, and sometimes on public roads. What the Fort Monmouth center will provide is a place where <u>everyone</u> can test in real conditions in a safe way, not in isolated, idealized locations.

There are significant hurdles that need to be overcome before self-driving vehicles are operating on all roads, and those who have been working on autonomous vehicles have prepared a short list of them: snow, heavy rain, construction and accident zones, humans directing traffic, parking lots, and—not the least significant—the road on which the vehicle is driving is not on the map. Systems, such as Google's, that are heavily dependent on map data, require much more detail than is available in a standard navigation map, or even in a map data set used for advanced driver assistance systems where drivers are still using their senses. Before Google lets one of its autonomous cars out on a road with at least two staff in the car, one controlling the computer controlling the car and the other sitting behind the wheel ready to take over, it maps the route in excruciating detail, in essence creating a model of the world before people and other cars are added. The on-board sensors inform the on-board software of what it sees, and the software computes, on-the-fly, how the car should modify its behavior accordingly.

Will map suppliers have to map the entire world in super high precision in order for autonomous cars to be able to safely run on the roads? If so, having autonomous cars available for sale in 2020 might be a bit optimistic.

"As a result of the base closing, New Jersey created the Fort Monmouth Economic Revitalization Authority (FMERA) to implement a 20-year development plan for the Fort. The legislation establishing FMERA also created the Fort Monmouth Transportation Planning District in which the authority is charged with developing a multi-modal "comprehensive, future-oriented district transportation plan." This plan could allow the operation of automated vehicles within the site under a variety of real-world conditions."

Pacts Conference
Driverless Vehicles: from technology to policy
22 October 2014
10.00 to 16.00
Thatcham Research
Colthrop Way
Thatcham, Berkshire; UK

Parliamentary Advisory Council for Transport Safety (PACTS) *conference at* Thatcham Research *will bring together vehicle technology experts and policy makers to explore how new technologies (driverless, driver assist and others) can best be exploited to reduce crashes, achieve casualty reductions and to improve safety for all road users.*

The Connected Car and Cyber Security

computer via a web browser or e-mail and use the processing power of the computers that were left on even when not in use to function in a supercomputer-like web.

Our vehicles have become part of *cyberspace*[1], 'shorthand for the computing devices, networks, fiberoptic cables, wireless links and other infrastructure that bring the Internet to billions of people around the world' *(The Economist: July 12th 2014).* According to the data from Cisco presented in *The Economist* article, by 2020, there will be 50 billion Internet connected devices on the planet. Automotive will account for a measly 2 of those billions, but that is still a big number.

It seems that the IT security industry has taken notice and is now discovering that wireless connectivity in vehicles could potentially be a new market for their services. Two of them, Charlie Miller and Chris Valasek have written a report in which they claim they have evaluated the vulnerability of twenty car models and found that three of them, Infiniti Q50, Jeep Cherokee and Cadillac Escalade, are the 'most hackable'. They base their conclusions on a 'review of key criteria, including the number of remote access technologies such as WiFi and Bluetooth that could allow hackers to gain control of systems to manipulate and cause physical damage to the cars'. They did not test the vehicles themselves! In essence, what they have concluded is if you put wireless technology in your car, you will be hacked, and the more you put in, the more 'hackable' you are.

Contrary to what one reads in the industry press, automotive engineers are very much aware that adding connectivity to their vehicles involves ensuring that all of the security issues are addressed. The best way to keep hackers out—other than not adding connectivity—is to separate the vehicle completely from direct access to the Internet, and this is where the filtering enters the scene.

Companies like Volvo, with its Ericsson platform for Internet access and WirelessCar for telematics functionality, or Audi or BMW or Mercedes-Benz and others, have built systems that serve as a gateway between the open Internet to the on-board infotainment and safety/security systems. These gateways, whether they are basic Internet server platforms (e.g. Audi) or full-function telematics servers (e.g. BMW), they do not allow communications modules in the vehicle to connect directly to the Internet. All traffic passes through their systems, and the browsers in the vehicle are adapted to work with the services that are offered. Even though the customer may be listening to music that is delivered by one of the Internet radio providers, that service is first passing through the OEM's Internet server. As a result, not all services get to the customer because there first has to be an agreement between the service provider and the OEM.

What about that roadside assistance call? The motoring organisations in Europe have been demanding that the OEMs open up their systems to allow customers to choose their roadside assistance provider (*See The Dispatcher, 17 Mar 2014; Page 4*). They want the data being compiled by the on-board systems to be delivered to any supplier of the customer's choice, and they want this to be written into the data protection laws being written by the European Parliament.

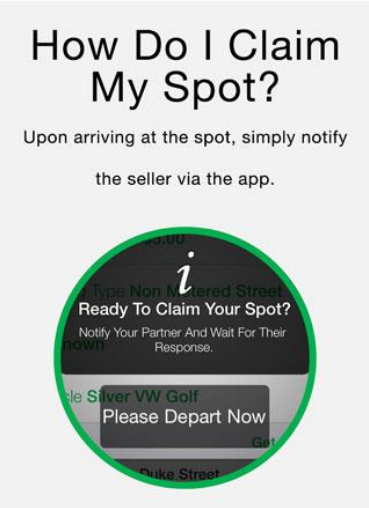
The integrated OEM safety/security systems, like those offered by Volvo, Mercedes-Benz and PSA, have highly encrypted data messages that are sent to a single TSP, and those TSPs provide the interface to operator workstations used by the selected customer call center. In Some cases, this call center is also the roadside assistance provider, but in other cases (e.g. BMW) it is not.

Establishing similar connections with multiple service providers that could potentially be selected by a customer is not impossible, but it is impractical. Aside from the cost that would be borne by the OEM, the principal problem is guaranteeing the security of the vehicle from which the data is sent. Note, I did not say guaranteeing the security of the data. If vehicle systems are compromised by a hacker who has been able to gain access to the ICUs controlling the engine, brakes or steering, it will be the OEM who will bear the responsibility of the consequences, including the death of the driver and passengers.

Do the 'open source' solutions solve this problem? There are none at present, but they are coming[2]. Toyota, Fiat and Ford have been using Microsoft's Automotive 'Common Source platform[3] for some years and they still use a gateway approach for reasons of security.

Developing a winning infotainment and safety/security solution for automotive is a lot like playing chess. In chess, making one bad move can end in losing the game, but you don't know that until you are mated. Making one wrong decision with a connected vehicle can have much direr cyber security consequences. This is why automotive engineers are so very, very careful.

The Not-So-Sharing Economy: One (ST)App Too Far



This screen shot says it all. Claim Your Spot! It's like staking a claim in a national park for building a house. The seller is the buyer's 'Partner'.

I am on the record as a hard and fast opponent of charging for anything that was originally paid for with public tax monies.* So I saw **RED** when I read about *MonkeyParking* and *ParkMoDo*. These apps let people who are about to vacate a public, on-street parking location make money by broadcasting the location of the spot and allowing those in circling distance to bid between $5 and $20 to take it over. What gall!

Think a moment about this. You live in an apartment building in a city where on-street parking is one of two choices you have if you need to own a car. The other is off-street parking (if it exists) at a cost probably equal to your monthly rent. Someone—maybe a neighbour or maybe a person from the next town—starts a business by standing in a parking space to be vacated in front of your building and charging you twenty bucks to get into it. Once there, you then pay the city for the right to park. How does that sound to you?

MonkeyParking was operating only in San Francisco until the city's attorney issued a cease and desist order and threatened the company with a lawsuit unless it removed its service. The company initially refused, stating that the city did not understand the world's new paradigm of sharing. Look at *uber* and *Airbnb*, companies that let sellers of car rides and space in their homes meet directly with potential buyers. What's the difference, they asked. Well, for one, there is a city ordinance in San Francisco that specifically prohibits anyone from selling or renting public parking spaces. For another, how about some simple common sense. What would you think about an app that let you sell your seat on the bus to one of the people standing in the aisle, or selling your table reservation at a popular restaurant, the one you had booked months ago, to the highest bidder?(RestaurantHop has done this. What gall too!) Outrageous insolence? The developers reply that they have simply found things that are being priced below their market clearing level, at which demand equals supply.

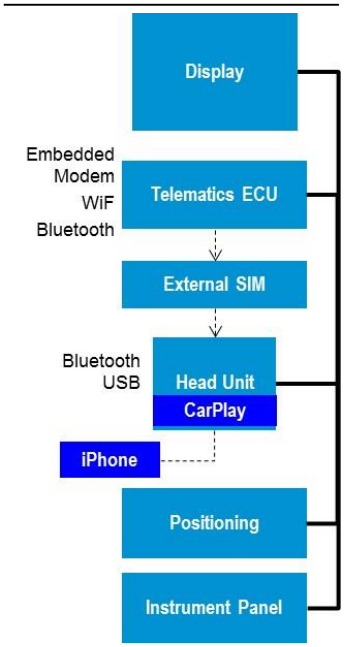
MonkeyParking on July 10th "temporarily disabled" its service in San Francisco, one day before the deadline set by the city's attorney to cease and desist. My guess is that we have not seen the last of them, unfortunately, and these services will start showing up on a navigation system screen near you any day now.

** See www.michaellsena.com; Articles; Time for Action, an article I wrote for **Computer Graphics World** in May 1992.*

Apple CarPlay-Open Automotive Alliance-Genivi

If Apple has been anything since it found its way following the return of Steve Jobs as CEO in 1996 it is consistent. It created its new business model to support its strategy of selling products that uses content developed specifically for those products. The **iPod** was first then came the iPhone. Jobs described the **iPhone** as an iPod connected to the Internet. The iPad was a bigger iPhone that was more convenient for presentations and reading. Apple says, in essence, that its new *Apple CarPlay* is an iPhone writ large on wheels. Using its Lighting cable to connect the iPhone via a USB port in the vehicle, *CarPlay* turns control of the iPhone over to the vehicle manufacturer's HMI. In the case of Volvo Cars, who have incorporated *CarPlay* into their soon-to-be-sold new XC90, iPhone and Volvo controls coexist on the large touchscreen. Apple discussed *CarPlay* at its developer's conference in 2013 as *iOS in the Car*, but the name was changed when it was introduced at the 2014 Geneva Auto Show. Some iOS code is in the car, but the heavy lifting is done by the iPhone.

Apple CarPlay and the Open Automotive Alliance versus Genivi (continued from p.4)



This is an example of one of the infotainment and telematics architectures in today's mid-to-high-end vehicles. Not every vehicle has a SIM-holder for a private SIM-card, or a special telematics unit or a separate positioning module, but car OEMs have generally componentized the instrument panel, head unit and display. Genivi would like to orchestrate them all.

** GENIVI (pronounced gen-ee-vee) is a concatenation of Geneva, the international city of peace, and the acronym IVI, for In-Vehicle Infotainment, heralding a new era of cooperation among automakers, suppliers and technology providers in the interest of streamlining the development and support of connected services to cars aligned with mobile devices.*

Apple *CarPlay* does not really turn a normal car into an *iCar*. The iPhone has to be present, and until Apple develops a WiFi connection, the phone must be tethered to the head unit of the vehicle. Further, the vehicle needs a full-function infotainment system for those times when the iPhone is not in the car.

The Open Automotive Alliance is another kettle of fish. OAA is "a coalition of tech companies and auto industry leaders committed to bringing the Android platform to cars." Since Android belongs to Google, Google is leading the initiative. Original members were Audi, GM, Honda, Hyundai and NVIDIA, who were soon joined by a host of others, including Volvo. While Apple keeps the bulk of its iOS out of the car on its phone, OAA builds Android into the infotainment unit. The integration can be complete, in which case Android serves as the OS for the infotainment platform, or it can be one of several applications running in parallel, cohabitating in the head unit with Apple-, Microsoft-, QNX- (BlackBerry) and other OS-based solutions.

OAA sees its mission as "accelerating auto innovation with an approach that offers openness (obviously, given the name), customization and scale". Google's message: By incorporating the Android OS on board, customers will have access to all the mobile apps that have been developed for other wireless devices. Strategy Analytics' Roger Lanctot points out why this is not quite as easy as it sounds in a January '14 analysis he wrote in connection with the Consumer Electronics Show. Based on research done with auto industry suppliers, Roger concludes that "Android is ill-suited to supporting automotive grade acoustic requirements, media players, TV and RF receptions, amplification and voice recognition…Android is simply incapable of going it alone in the car." So while the automotive OEMs may want to have Android-enabled, as well as Apple-enabled--and perhaps Microsoft-enabled ones if Microsoft/Nokia phones regain some traction—they are not rushing to build their head units around them or to allow them unbridled access to the mission critical on-board systems.

Most automotive OEMs have already developed Apple or Android infotainment solutions or are in the process of doing so. It would be dereliction of duty not to do this. Customers arrive at dealers today knowing what car they want to buy after they have performed their checklist exercise on the Web. Not being able to connect the prospective buyer's chosen phone or play his or her favourite music or news or navigation app could be reason enough to knock a contender off the final list. At the same time, OEMs are trying to solve the bigger problems: reduce development cycle time and cost; eliminate wasted time and money for re-creating non-differentiating in-vehicle infotainment features across multiple models; and, sharing the task of innovation and product maintenance across the entire industry.

In 2009, the **Genivi Alliance*** was formed, with BMW, GM and PSA joining Wind River, Visteon and Magneti Marelli, to address these problems by developing an open-source car infotainment platform. The Genivi Alliance is built around the principle of collaboration. *Collaborate or Die* was the title of a panel sponsored by the Alliance at last year's CES. The goal is to "build a common software architecture scalable across different product lines and versions." It started as an infotainment initiative, as the name suggests, but it is now viewed as an approach for all on-board systems. Genivi is not an operating system. It delives a reusable, open-source platform consisting of Linux-based core services, middleware, and open application layer interfaces. Genivi says that "automobile manufacturers and their suppliers will use this platform as their common underlying framework and add to it their differentiated products and services (the consumer-facing applications and interfaces).

Michael L. Sena Consulting AB

Sundbyvägen 38
SE-64551
Strängnäs
Sweden

PHONE:
+46 733 961 341

FAX:
+46 152 155 00

E-MAIL:
ml.sena@mlscab.se

We're on the Web!

See us at:

www.michaellsena.com

Are Electric Cars the Answer: Two Car CEOs Give Their Views

An article in our local newspaper's Saturday special ***Motor*** section showed a picture of a pensive Sergio Marchionne, CEO for Fiat Chrysler Automobiles. The caption under the picture read: *"I hope that you don't buy it."* The 'it' he was referring to was the Fiat 500e, their electric vehicle. Why?

"Because every time I sell one it costs me $14,000." Small cars with expensive technology are a difficult equation for car manufacturers.

"The reason we started with a $100,000 sports car is that when technology is new it tends to be expensive," says Elon Musk, the co-founder of PayPal who is the chief executive of and a big investor in Tesla. *"It just takes time to optimize the right design and work up to economies of scale. . . . Why we didn't start with a Honda Civic is that it would be a $70,000 to $80,000 Honda Civic."*

We'll take this up in the next issue.

Invest in frastructure: It's Good for You

Whether cars and trucks are driven by electric motors or diesel, petrol, ethanol, gas or fuel cells, or whether they are self-driven or driver driven, until we have a completely new technology replacing the present one with wheels on ground, we will have roads. Roads that are poorly built and maintained are not only unpleasant to drive on; they are unsafe. In the US, if something is unsafe it is fertile ground for lawyers who make their livings filing individual or class action lawsuits against private companies and public authorities, and they have been busy. Have you ever had a tire blow out after hitting a pothole? Have you ever damaged your vehicle or had an accident as a result of poorly maintained roadway? A 2013 study by the OECD* reported that its countries spend an average of 0.85% of GDP on road/rail/Inland water infrastructure, down from 1% in 1995. In Western European countries, the percentage spent on roads dropped from 69% to less than 60%. It rose from 68% to 82% in Central and Eastern Europe. The US, where bridges are crumbling and tire-eating potholes are common fare, spends under 0.5% of GDP on roads, and the share of maintenance as a percentage of total road expenditure has dropped from 34% to 30%. Worryingly, some European countries have followed suit.

Road fatalities have decreased more in those countries/regions where investments in roads have been the highest, namely Australia and Japan, and less in North America where investments have been lowest.

**Spending on Transport Infrastructure 1995-2011: Trends, Policies, Data*; OECD International Transport Forum (2013).

Footnotes:

1. William Gibson, a science fiction writer, first used the term cyberspace in 1982 in a short story which later became a novel, Neuromancer. He called cyberspace 'a consensual hallucination experienced daily by billions of operators and a graphic representation of data abstracted from the banks of every computer in the human system'. Prescient!

2. A Common Source platform is one that provides tools for many developers to write programs that use it while the source code remains in the domain of its developer. It is distinct from Proprietary, Open Source (Free or Fee), Common Standard, Industry Standard and Shareware.

3. The Linux Foundation is driving an open source for automotive campaign with their Automotive Grade Linux. JLR, Hyundai and Toyota are members, as are many Tier One hardware suppliers. The Open Automotive Alliance led by Google with Android, has Audi, Honda, GM and also Hyundai.

About Michael L. Sena Consulting AB

Michael Sena works hard for his clients to bring clarity to an often opaque world of vehicle telematics. He has not just studied the technologies and analyzed the services. He has developed and implemented them. He has shaped visions and followed through to delivering them. This newsletter touches on the principal themes of the industry, highlighting what is happening. Explaining and understanding the how and why, and developing your own strategies, are what we do together.