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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:

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- French Connection to telematics hardware
- 3D Printing

Telematics Industry Insights by Michael L. Sena

WirelessCar: Past, Present and Future

WIRELESSCAR WAS NOT SOLD to HCL Technologies along with Volvo IT. HCL Technologies is an Indian IT company that won the battle with IBM to take over the division that has been providing all computer-related services to the AB Volvo Group since computers started being used by the company. AB Volvo Group comprises Volvo Trucks, Renault Truck, Mack Trucks, Volvo Penta and Volvo Construction Equipment. (Volvo Cars is not part of AB Volvo Group, has not been since May 1999 when it was sold to Ford. It is now owned by Geely). The deal with HCL, which is estimated to be around $110 (€103) million, is expected to close in Q2 2016.

Until the sale of Volvo IT is finalized, WirelessCar, based in Gothenburg, Sweden, will continue to be a department within Volvo Group Telematics (VGT), which is a division within AB Volvo IT. (It always sounds like a shell game when I tell the story, but stay with me. It really is not so confusing.)[1] WirelessCar started life in 1999 as a joint venture among three Swedish companies, AB Volvo (when Volvo Cars was part of the Group), Ericsson Venture Capital and the Swedish telecom before it became Telia Sonera. Slow start-up, investment capital difficulties during the dot.com bust and the problems of starting a completely new business—a telematics service provider—in an industry that still did not understand the concept of selling services, caused the company to first downsize in 2002 and then to become incorporated into AB Volvo in 2006. In 2007 it was folded into Volvo IT. In 2011, VGT was formed to provide telematics services to Group companies, and WirelessCar became a division offering services to external companies, including its first customer, Volvo Cars.

Being part of a larger company and delivering to that company key services which have now become core components of Volvo Trucks, Volvo Bus and Volvo Construction Equipment has offered WirelessCar a secure environment. Its clients have grown from only Volvo Cars and AB Volvo as late as 2006 to include, Audi China, BMW in China through China Unicom, Qoros, Nissan and Infiniti. Mercedes-Benz signed on in November. Others, still unofficial, will be added soon.

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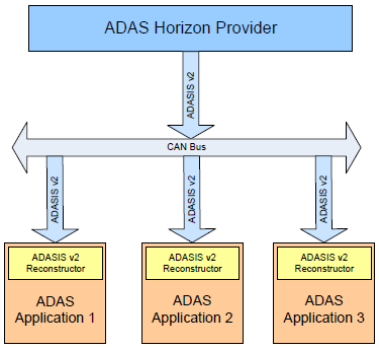
WirelessCar's first office

Göte älv (River of the Goths) separates Hisingen Island from the rest of Göteborg. Hisingen is where AB Volvo *and* Volvo Cars *have their headquarters and production. Beside the river, across from the center of Göteborg, is* Lindholmen's Dry Dock and Shipyard Co. *Once it built Sweden's navy's vessels and ships that crossed the world's seas. In the 19th century, the ships made at Lindholmen carried Swedes to America, seeking a better life than the one they had at home. The shipyard closed in 1977 when the rest of Europe and Asia caught up to Sweden following the Second World War. Göteborg, with the shipyard, went down for the count, like Ingemar Johansson, its hometown boy, in his last fight with Floyd Patterson. Ingo called it quits, but Göteborg and Lindholmen have come back. Since late 1999,* Lindholmen Science Park *has risen as an automotive technical competence center like a Phoenix out of the ashes. One of its earliest tenants was WirelessCar.*

Göte älv is part of the DNA of WirelessCar. The river's mouth and the sea is close by to the west and the winds blow hard. You don't live in Göteborg if you don't have thick skin and can roll with life's punches. WirelessCar has had its share of punches to roll with since it started back in 1999. It turns out that Göteborg is a good place for it to be.

ADAS Interface Specification



The figure above shows the ADASIS v2 system architecture. The ADAS Horizon provider generates the electronic horizon from stored map data for transmission to the applications. The ADAS Protocol defines how the ADAS Horizon will be sent from the Horizon Provider to the applications. An ADAS Application is a client application that receives the ADAS Protocol messages and then reconstructs and uses the ADAS Horizon. The ADAS Reconstructor receives, parses and interprets ADAS Protocol messages and reconstructs a copy of the ADAS Horizon on the client side.

The above map illustrates the concept of an electronic horizon. In v2 of the Protocol, the applications are presented with *paths*, rather than the individual links that make up the *paths*. This reduces complexity and increases efficiency of transmission over the relatively slow CAN communications channel. To further increased efficiency, *Optimized Path Representations* are defined in which sub-paths along a most probable path are consolidated to a degree. Road attributes and geometry are defined as characteristics of the paths, which each have unique identifiers. Locations of objects along the paths, including the vehicle, are defined by offsets.

ADASIS Forum Part One: Background

THE ADASIS FORUM HAS ITS ROOTS in an initiative started in late 2000 by Navigation Technologies (known by its shortened version, NAVTECH, then Navteq and now known as HERE). NAVTECH took up the challenge to engage its competitor, Tele Atlas (later TomTom), along with the car and truck industry to develop a standard for map data elements used in advanced driver assistance systems (ADAS). One impetus for this was the frustration over the lack of a physical storage format (PSF) standard for navigation map data, and a determination to avoid a similar problem with ADAS map data. I was part of the original ADASIS group because of my work to develop a PSF standard.[2]

NAVTECH, GM Opel, BMW, Volvo Technology, DaimlerChrysler (later back to just Daimler), Tele Atlas Ford, Siemens VDO (later Continental) and Bosch were among the early participants in the ADAS group. NAVTECH hosted the first meeting if the group at its Frankfurt office on 10 May 2001. During 2001, Zenrin, Nissan, Toyota, Renault and a few other companies joined the effort. The principal objective of these early meetings was to determine if the automakers and mapmakers could work together. The system makers were important as well, but not as important as they had been with the PSF standard. Then, they controlled all of the navigation pieces in a single box. With ADAS, there were many more pieces distributed in the vehicle and connected by the CAN bus.

An initial draft of an ADAS interface specification based on the concept of an electronic horizon gradually evolved from these early meetings. Some patent initiatives had already being taken, including one by NAVTECH[3], around the concept of creating a simplified map in front of a moving vehicle with just those road data elements needed for the particular ADAS application being supported. This is what is meant by an electronic horizon. Nevertheless, there was a surprisingly open dialog among the parties about how IP could be shared. At that point, using map data as a sensor for ADAS was not at all a given, and we all knew it. Cameras, radar and other sensors had the edge.

When the draft specification had been completed it was time for the group to decide on a next step. Should the work be brought to CEN or ISO[4] for standardisation, or should we set up an industry group, similar to what had been done for RDS-TMC? There were not many models for such cooperation back then, such as GENIVI. We decided against the official standardisation track for the time being and agreed to approach ERTICO with the proposal to set up an organisation that would have paying members and a legal terms of reference. The ADASIS Forum was created in 2002 with the first project meeting held on 28 May 2002.

In addition to a working group on Standardisation and Industry Liaison, which I led, there were working groups for Data Requirements (Tele Atlas), Architecture (DaimlerChrysler) and API and Data Entity Specifications (Navigon). The objectives of the standards effort were to define an open data model and structure to represent map data in the vicinity of the vehicle position, and to define open APIs to enable ADAS applications to access the electronic horizon and position-related data.

Between 2002 and 2008, much of the work on the ADAS interface spec was done in projects, including Maps&ADAS, a sub-project in PReVENT, and SOLVI, a Swedish project funded by Vinnova.

In June, 2008, ADASIS V2 was presented at the General Assembly meeting held at Ford's Aachen, DE facility. The members were asked whether they now wished to move to an official standard. CEN had approved the proposal to submit the spec the previous month. The members voted to keep ADASIS as an industry standard managed by the ADASIS Forum. The Management Board formalized this decision in October, 2008.

Big Data: Is it the OEMs' answer, or just another question?

WHAT DO CAR COMPANIES and Rodney Dangerfield have in common? Both have problems getting respect. General Motors had revenue of $156 (€144) billion in 2014, with net income of $2.8 (€2.6) billion. Its market capitalization in August 2015 was $58 (€53) billion. Respectable? Not when compared with some upstart start-ups. In July 2015, Uber, the multi-national taxi company, had a market capitalization of $50 billion (although its shares are still private), its revenue projected to year-end 2015 is just under $2 billion and it continues to lose money. It is currently in a new financing round that could lead to a market cap of over $60 billion.

One of the reasons the automobile industry companies in general have been among the lowest valued according to market capitalization is that they are among lowest profit margin[5] businesses. According to 2015 US figures compiled by New York University[6], net margin for car companies is less than one-half the standard for all industries, (3.16% versus 7.84%). Google's average gross profit margin since 2003 has been 23.24%. Apple's has been 40% for the past five years!

So why are Apple and Google and a raft of other high-tech companies ogling the car industry? Their reasons vary with their business models. Apple will sell *iCars* and Google will license *Android Car Brains*. Whatever they do, it will have less—or nothing—to do with driving (or, piloting space ships in the case of Audi with its *You drive this. You feel that* ad) and all to do with using and generating data. Motorized vehicles are already generating lots of data, but they can produce a lot more. They are currently not using much data, but as they become a set in the universe of Internet connected objects, they will use data in ways and amounts that have already been imagined, but have not yet been possible to realize.

Vehicles will be part of the Big Data grid. "Big Data promises to be for the 21st Century what oil was to the 20th: the fuel driving all that we do," says Shomit Ghose of ONSET Ventures. "The challenge and opportunity of Big Data will be to find a way to make sense of all of that valuable data." This fuel is being created in fantastically large volumes, with 4.4 zettabytes (4.4 x 1021) of data produced in 2013, and that volume growing to 44 zettabytes of data produced in the year 2020.[7]

It was in 2001 that META Group (now Gartner) analyst Doug Laney defined data growth challenges and opportunities in Big Data terms. He described it as being three-dimensional, increasing in volume or amount of data, velocity, or speed of input and output of, and in variety, or the range of data types and sources. In 2012, Gartner updated its definition: "Big data is high volume, high velocity, and/or high variety information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimization." A new V, for veracity' (reliability, accuracy) was added. Mark Boyadijs of IHS Automotive, a strategic consultancy, added a fifth V for value and the value proposition. [8]

There are some who believe the term 'Big Data' is a buzzword, especially when used in relation to vehicles. I am not one of them. By 2020 there will be an estimated 152 million actively connected vehicles on the roads. While this will be a fraction (0.8%) of the total number of 18 billion Internet of Things devices, these cars will be generating an estimated 11.1 petabytes of connected car data by 2020, according to IHS.

The IHS report identifies five core categories of data that will be most important to automakers, their suppliers and their customers: diagnostics; location; user experience; ADAS; and, autonomous driving. Frost & Sullivan, who have produced a number of studies on Big Data for the automotive industry, have a short list of 33 current and forward looking innovative services that will benefit from Big Data. The innovative services include cross-brand ownership analytics, driver behavior analysis, prognostics and predicting recall scenarios.

The predicting part is why Big Data is of such great interest today among Silicon Valley entrepreneurs and investors, and why they are interested in the automotive space. That point was clarified for me by Mr. Ghose. It was when I was searching for the inventor of the term Big Data that I found the reference to Shimit Ghose of ONSET, and his short essay on Who Invented Big Data (and Why Should We Care)? He wrote:

"Despite the current level of visibility and frenetic activity surrounding Big Data, it turns out the concept was first pioneered in the 1940s by Hari Seldon, professor of mathematics. At Streeling University. On the planet Trantor. In Isaac Asimov's **Foundation** *science fiction trilogy. The premise underlying Asimov's books was that Professor Seldon had developed a branch of probabilistic mathematics that allowed the future to be accurately predicted. This is, as it turns out, exactly the promise of Big Data: predicting what will happen next based on analysis of enormous volumes of historical data."*

As those of you who are regular readers of The Dispatcher know, I am a fan of Asimov, who was a professor of Chemistry at Columbia University in New York when he was not writing books.[9] He is the author of the Robot series. Cars as robots and Big Data close the circle. Will the car companies be able to transition from moving metal to connecting cars before it is too late? Three German car companies bought HERE for its data processing capabilities, not for its data. That is a very hopeful sign. Big Data is a big part of the OEMs' answer. No question.

Mitsubishi Electric Corp. (Melco) Lights Up the Road

In late October, Melco used the Tokyo Motor Show to announce a new safety system it has developed. It provides for illuminated projections on the road surface at night to indicate the intentions of the driver and vehicle. The vehicle above is signalling that a door will soon be opened. It also can create a set of light patterns to show that it will be backing up, moving forward or making an emergency stop.

The idea is to inform other drivers and pedestrians by projecting large, easy-to-understand animated illuminations onto road surfaces. Melco claims that the system will help avoid road accidents while "lowering the potential frustration or confusion of nearby drivers and pedestrians".

According to research by the Institute for Traffic Accident Research and Data Analysis, 70 percent of pedestrian fatalities on roads happen at night. Many of these could be prevented if pedestrians wore reflectors and signalled their intentions, but lighting up the road with information should help to bring these numbers down.

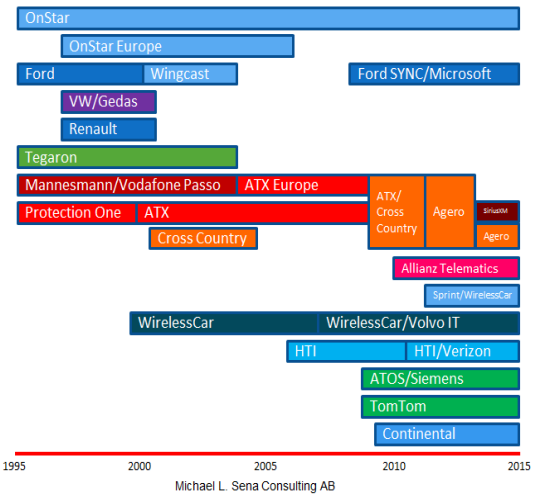
So obvious! Why so long in the making? New technology. Small, affordable LEDs are expected to be used in increasingly sophisticated lighting systems. Melco's news release stated: "Market initiatives to use lighting sources for safer roadway environments are expected to increase from US$6.3 billion in 2013 to US$10 billion by 2022, according to the Fuji Chimera Research Institute, Inc."

Twenty years ago I had the pleasure to work with Melco engineers, and it is good to see that the innovative spirit of the company is still very much alive and well.

WirelessCar: Past, Present and Future (Continued from P.1)

What does WirelessCar actually do? That question is one the company has been trying to answer since it was founded. It turns out that it is perfectly described in the title of the patent granted to Volvo Technology Corporation for what became WirelessCar: *System and method for communication between a central station and remote objects*. In summary, WirelessCar integrates the three principal components of a telematics system: the on-board unit; the telecommunications infrastructure; and, the service providers, such as emergency assistance, logistics tracking and subscription management.

What was so innovative about that? Aren't all connected car services based on a central message handler that links the vehicle to the telecommunications and service infrastructure? In 1998, when this concept was developed, they were not. They became so, gradually. The early solutions developed by Tegaron and Passo (Mannesmann then Vodafone) were country-based solutions that did not scale to multiple countries, and definitely not to multiple continents. At one point, BMW was using WirelessCar in Australia and Dubai, Passo in Germany and a few other countries in Europe and ATX in the US. OnStar had one platform based on AMPS in the US and one based on GSM operating only in Germany. Daimler had ATX in the US and Tegaron in Germany.



BMW, working with WirelessCar and SEI/Ygomi, created NGTP (Next Generation Telematics Pattern)[10] in order to leave its legacy, country-based solutions behind. NGTP is a telematics framework and a technology-neutral telematics protocol that brings greater flexibility and scalability to the industry. It is a further evolution of what WirelessCar created for its first customers who understood that the problem was not to find a way of reducing communications costs that resulted from country-based SIM-cards, but to find a way of creating a global solution that M2M MNOs would support. That was the innovation.

WirelessCar did not start life with the ambition of being and end-to-end connected car system and service provider, like OnStar. It didn't do services or on-board hardware then, and it doesn't do them now. It has designed its latest version of its Telematics Service Delivery Platform (TSDP) based on the NGTP pattern. In its own words, *"TSDP allows for better integration to provide the vehicle, smartphone apps, web portals and call center clients the information needed to operate telematics services in a secure and efficient manner".*

TSDP will help WirelessCar do more of what it needs to do to meet the challenges of a new group of companies, led by Apple, Google, Facebook, Alibaba and other non-automotive companies on one hand, and IT companies like Ericsson, IBM and Bosch on the other, that are vying to become the next generation telematics service providers. WirelessCar has a major advantage over these companies with its fifteen years of experience delivering highly secure services. Nevertheless, future success will require moving very, very large volumes of data, both from and to the vehicle, and expanding into the processing of this data, rather than simply serving as a pipeline or traffic cop. With a fresh start, outside of the Volvo IT group, it should be able to focus on this task.

Management by rule-breaking is transforming the industry

THIS IS AN OBSERVATION, not a prediction or a forecast. In a few years we will look back at the autumn of 2015 as the time when rule-breaking by two auto manufacturers, one of the biggest and one of the smallest, altered the automotive industry forever.

Tesla Motors has begun rolling out its semi-autonomous 'Autopilot' mode to Tesla Model S cars everywhere except Japan, where regulators just said 'No'. The Tesla Autopilot, which was announced in July 2015, allows supported cars to steer themselves on motorways, change lanes when their user pushes the turn signal and even find a spot and parallel park by themselves. Autopilot is not just available in new cars rolling off the assembly line in Fremont, CA. It is being wirelessly retrofitted to all models capable of accepting it. The firmware over-the-air (FOTA) update to Model S Software Version 7.0, which is done overnight, takes advantage of extra detection features that had been included in Tesla vehicles produced since October 2014, including a forward radar, a forward-looking camera, 12 long-range ultrasonic sensors positioned to sense 16 feet around the car in every direction at all speeds, and a high-precision digitally-controlled electric assist braking system. Autopilot also has the ability to read stop signs, detect pedestrians, and use sonar to detect anything around the vehicle.

Based on a stream of reports via Tweets from Mr. Musk himself, he sought and obtained regulatory approval. However, I can find no evidence of this. What regulations would he be referring to? All countries that have signed the Geneva Convention on Road Traffic (1949) or the Vienna Convention on Road Traffic (1968) require that there is a driver ready to take control of the vehicle. In Europe, Tesla's ECUs have been type approved and the Model S has EC Whole Vehicle Type Approval. It would be highly unusual if a company simply asked for a testing agency in one of the European countries to provide a waver or to extend type approval to a component or the vehicle as a whole. In the US, NHTSA issues safety standards, but it neither approves motor vehicles nor parts complying with these standards. The onus for compliance to standards is on the manufacturer. Some states in the US allow cars to be driven in hands-off mode. So who was he asking for permission, and what was he telling them Tesla was about to do?

It is my guess that Tesla simply finessed the introduction their self-driving functionality by saying it pre-existed in the components and is now being activated with the Tesla Firmware 7.0 update. So, is Tesla breaking any laws? CEO Musk has told Tesla customers that they should "…be quite careful with Autopilot" and should "still keep their hands on the wheel". And yet he has the gumption to treat driving like taking a new PC software release out for a spin. He said: "We think of it sort of as a public beta, I think it is going to be quite a profound experience for people when they used it." Youbetcha!

While those smart Tesla cars know when to drive themselves and when they need help, and under exactly what conditions this will be the case, the drivers who everyone says are competent enough to drive their own cars cannot react quickly enough to take back the reins from the horse.

By pulling this stunt (and that is what it is, perhaps to mask falling sales or a Q3 loss that is four times higher than a year ago) Elon Musk with Tesla has set a dangerous precedent that will be used by the regulating authorities worldwide to tighten the regulations, perhaps prematurely and to a degree that may not be conducive to unbridled development. Hopefully, no one will be killed or injured while they perform the task of beta test dummy. Pull it back before someone gets hurt, Mr. Musk.[11]

Continued on p.6

PURLOINED NAMES FOR CARS

Henry Ford, Walter Chrysler and Armand Peugeot named their companies after themselves. They make Mustangs, Rams and Lions. Fiat is not Latin for 'let it be done', but an acronym for *Fabbrica Italiana Automobili Torino*. Volvo and Audi are Latin, meaning, respectively 'I roll' and 'listen'.

Nikola Tesla and Michael Faraday did not found car companies, but their surnames have been taken by two Silicon Valley car companies, Tesla Motors, Inc. and Faraday & Future Inc. You have all heard of Tesla. F&F may be new to you. Tesla co-founder, Martin Eberhard (the other co-founder was Marc Tarpenning) thought the name 'Tesla' sounded cool back in 2003 when the idea for an electric sports car popped into his head. There was logic to it as well: Nikola Tesla invented the AC induction motor; Eberhard's and Tarpenning's car has an AC induction motor; *ergo*, their car is a Tesla. The name does have a nice ring to it. Imagine if Elon Musk decided to put his cognomen on the brand when he came on board as Chairman in 2004.

A *Road and Track* article published on 20 November 2015 described Faraday & Future Inc. as a 'shadowy electric car startup'. (It seems the company shortens its name to Faraday Future in all communications.) Its management team is made up of four former Tesla executives and one from BMW. It is developing an all-electric sports car. It is playing the same game as Tesla to get US states to compete to have its factory located in their state (Tesla did it with their battery factory). And they have a name that links the company to the dawn of electric motors. In 1831, Michael Faraday started work that led to his discovery of electromagnetic induction. Still, FF management do not like to be compared to Tesla. They will do something completely different, they say. Well almost. Their first car (or service idea?) will be shown at CES in January, 2016

Who is behind Faraday Future? An executive of a subsidiary to the Chinese tech and media giant, LeTV. His name is Chaoying Deng.

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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 for your organization, are what we do together.

Management by Rule-breaking (continued from p.5)

Volkswagen's transgression, which at last count affects around 11 million vehicles worldwide, will have major effects on the company itself, how vehicles are tested in the future and how recalls are executed. The components controlling emissions that have been type approved in Europe, and the whole vehicle with these components installed, which also has been type approved, were in compliance with the EU regulations when they were tested. They were self-certified by VW in the US to comply with the applicable EPA regulations. In the majority of cases, these vehicles and their offending components can be brought back into compliance with a software update. However, none of these vehicles are technically capable of having such an update performed over-the-air. Further, the regulatory framework for doing so does not exist.

My observation is that in a few years' time, OTA updates for recalls will be standard practice, with all of the necessary security included. OTA updates of ECUs will not be allowed without some form of control on what the vehicle does and how it behaves after the update, and, more importantly, without ensuring that drivers know exactly what they should and should not do.

Where do new ideas come from?

ON ONE OF THE LAST SUNDAYS OF SUMMER this past September, my wife and I took a walk along Götgatan, a street in Södermalm, an old neighbourhood in Stockholm that has found new life. Near its end, closest to the center, is a book store with character. In it one can find books that would never have been found in the now defunct Borders. The book store was the main reason we took this particular walk. We were both searching for out of print books. Neither of us had any luck, but my eye was caught by a small paperback in the philosophy section.[12] The first chapter, *Human Nature: Justice vs. Power*, was a debate that took place in 1971 in The Netherlands between Noam Chomsky and Michel Foucault. The debate between the social theorist and idea historian, Foucault, and the libertarian socialist linguist, Chomsky, was a perfect example of the premise expressed by Foucault on creativity.

Foucault said that linguists 'analyze language as a system with a collective value, understanding results from a collective totality of rules allowing such and such knowledge to be produced in a certain period.' The linguists believe that there is an 'inventor' who discovers a new 'truth', and language is modified to describe that truth. He believes, on the contrary, that new thoughts 'are a matter of collective and complex transformations of understanding within a field in its practice and rules.' He suggests a modest experiment: read any twenty medical works written between 1770 and 1780, and then read any twenty between 1820 and 1830. In those 40-50 years, everything would have changed. Old prejudices and myths disappear. A new grid emerges with its own inner logic without a single inventor. A new understanding emerges with its own set of rules, decisions and limitations. We make new ideas.

Footnotes:

1. The first CEO of WirelessCar, Jan Hellåker, was manager of the department at Volvo Technological Development where I worked full-time between 7 January 1993 and 31 December 1996, and part-time up to April 2001. The idea for WirelessCar grew, in part, out of work we were doing for Volvo Cars on Volvo On Call.

2. In 1998-99 I was Chairman of the ERTICO Digital Map for ITS Committee which led an effort to gain consensus between navigation map data suppliers, navigation system developers and vehicle manufacturers to create a standard physical storage format that would be interoperable among all navigation systems. That effort failed, but a few years later a group was formed by the German carmakers that resulted in NDS, an industry standard PSF. I was a charter member of the ADASIS Forum and a member through 2013.

3. Andreas Hecht, Matthias Schmitt and Dietmar Rabel represented NAVTECH in those early meetings, and Andreas and Matthias were among those who had their names on one of the patents.

4. CEN/TC278 (European) or ISO/TC204 (International).

5. Profit margin represents the percentage of revenue that a company keeps as profit after accounting for fixed and variable costs. It is calculated by dividing net income by revenue.

6. http://www.stern.nyu.edu/~adamodar/pc/datasets/margin.xls

7. EMC annual Digital Universe Study: The Digital Universe of Opportunities (April 2014).

8. IHS Automotive Study: Emerging Technologies: Big Data in the Connected Car (2013).

9. The Dispatcher: Vehicles as Robots, p.5. Volume 2, Issue 5 (Sept. 2015)

10. WWW.NGTP.org

11. Before we went to press, Tesla said it would update their Autopilot software so that vehicles will be unable to exceed posted speed limits after online videos showed drivers doing "crazy things" with the cars drew criticism from competitors.

12. The Chomsky-Foucault Debate on Human Nature. The New Press (2006).

Notes:
In mid-December, the California Department of Motor Vehicles released draft regulations for driverless cars in the state, saying that self-driving cars must have a licensed driver behind the wheel at all times until the technology has been established as safe by a third-party audit. Google called the proposed regulations disappointing, saying the rules limited their ability to deploy new technology.

On December 22nd, Google and Ford announced they had come to an agreement on Ford building Google's next autonomous vehicle. Presumably, it will have a steering wheel. Is this the first crack in the pavement, so to speak, the first breaking of ranks? I wonder what Bob Lutz will have to say about this.