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Dinesh Paliwal: Samsung and Harman Going Big for Automotive

I talked this month with Harman CEO Dinesh Paliwal. I wanted to learn how Harman will make the difficult transition from a leading infotainment system supplier to an ADAS and autonomous driving platform supplier. I was also curious to learn how Harman and Samsung plan to work together following Samsung’s $8 billion acquisition of Harman in March 2017.

Samsung has fully committed to the auto industry. Why? In automotive Samsung sees a huge potential market for its technology and many of the components it already produces. “Electronics content will go from $1,500 per vehicle today up to approximately $8,000 2030,” predicted Mr. Paliwal. Samsung has microprocessors. They are the world’s number-one supplier of SOCs. They have microcontrollers and are developing neural network processing units. They are number-one in the world in displays and memory. And they have sensors. They produce everything from smartphones to home entertainment and appliances.

Samsung wants to take this estimable capability to the automotive market, where, before the Harman acquisition, they had very little presence. Harman will provide Samsung with a deep channel to its carmakers including Audi, BMW, Daimler, GM, Ford and Chrysler, among others. “We have a well entrenched Customer Business Unit actively managing relationships with the OEMs. Those relationships are particularly valuable to Samsung; they didn’t have those before they acquired Harman,” Mr. Paliwal noted.

Samsung will engage with the auto industry as a tier-two supplier, reaching out to all tier-one suppliers, globally. With Harman’s customers, however, all of Samsung’s automotive products and solutions will go through Harman’s sales channel. “For example, Samsung will allow Harman to be the first tier-one in the world to provide 5G telematics, a 10-times improvement over LTE,” said Mr. Paliwal. Samsung plans to demonstrate its 5G technology during the Winter Olympics in Korea in February 2018. Automotive 5G demos will come a little later, and the first orders for 5G telematics are expected as early as 2018.

**Autonomous/ADAS SBU**

This month, Harman and Samsung announced the establishment of a new business unit in Menlo Park, California, called the Autonomous/ADAS Strategic Business Unit, under the direction of John Absmeier. Before joining Samsung in November 2015, Mr. Absmeier spent nine years at Delphi, most recently working on autonomous vehicle development in the Valley. He will retain his current...
position as vice president of Smart Machines for Samsung’s Strategy and Innovation Center in Silicon Valley. Smart Machines will continue working on lidar, laser and sensor fusion projects and will continue to report to Samsung. The new Autonomous/ADAS SBU will become part of Harman’s Connected Car division.

A few hundred people are employed at the new SBU presently, but resources will quickly be ramped up to take on augmented navigation, augmented reality and vision processing projects. A few years from now the SBU could grow to 1,000 employees. “We will expand our software competence, with more algorithm development, sensor fusion and deterministic Ethernet technology,” said Mr. Paliwal. “As we have systems and products to deploy, including a fully functional architecture, which will be developed in line with our customers not just in isolation, we will bring the technology to market through Harman Connected Car.”

Apart from the SBU, Samsung is conducting corporate research in Korea that in five to seven years may have bearing on autonomous vehicle development. Needed will be technologies such as next-generation neural processing units, next-generation Ethernet protocol, lidar, laser and 3D cameras. Samsung has received approval to test drive autonomous vehicles in Korea and California. Samsung’s $12.7 billion investment in R&D in 2016 was second only to Volkswagen Group, according to PwC data.

From Infotainment to Autonomous Driving
Harman and Samsung are not yet in the forefront of autonomous vehicle development. “We do not yet have an autonomous vehicle solution,” said Mr. Paliwal. “However, we will demonstrate some L3 autonomous technologies at CES next year. [Fully] autonomous will be a tiny fraction of revenues across the industry. For the next seven or eight years, L3 is where the money is. That means ADAS, sensors, intelligent assistant in the car, 5G telematics, OTA updates, cybersecurity, analytics, all of that capability.” Harman launched technology called Harman Ignite at CES 2017. The cloud-based platform enables connectivity, device management, application enablement, analytics and managed services.

Harman’s OTA software updating solution is on the road in 25 million vehicles from 17 OEMs, according to Mr. Paliwal. “Each of the vehicles has the Redbend OTA client built into them,” he said. “Our OTA is serving ECUs from Bosch, Continental, Melco and Delphi, among others.” Every new platform that Harman develops will have OTA update capability and cybersecurity built in.
In addition to the investments made within Harman and Samsung, the two companies announced in September the establishment of a $300 million investment fund. Over a two- to three-year period the funds will be used to purchase equity stakes in startups and other companies that are developing technology needed to support autonomous driving. The first recipient is TTTech, which will receive a €75 million strategic investment from Samsung to accelerate development of its autonomous driving platform. Audi is also a major investor in TTTech. (See the May 2015 Hansen Report for more on TTTech.)

**Samsung Automotive Innovation Fund Recipients**

| TTTech       | Deterministic Ethernet |

**Previous Samsung Investment Recipients**

| Almotive   | Automated driving |
| Renovo     | Automated driving |
| Quanergy   | Lidar            |
| TetraVue   | Lidar            |
| Oculii     | Radar            |
| Autotalks  | V2X              |
| Valens     | HDBaseT technology |
| Graphcore  | Accelerators for AI and machine learning |

The auto industry is already intensely competitive, with scores of new entrants knocking, excited about new personal mobility and autonomous vehicle business opportunities. No fewer than 15 companies including Waymo, Apple, Intel, Baidu, and Magna are already offering autonomous driving platforms. What makes Samsung and Harman think they can win in this crowded field? Mr. Paliwal expects they will use a similar strategy as the one he used when he joined Harman as CEO: “At the time, sixteen infotainment suppliers competing in the market were too many. Those that were slow to adapt were marginalized by fast rates of technology development. I think you will see something similar happen here. Scale will matter, and with Samsung aggressively looking for growth in automotive, they will do whatever it takes to win, including acquisitions. Acquisitions would primarily be in the area of smart computing, smart connectivity, smart interface and ADAS algorithms.”

With $80 billion in cash on its balance sheet and lots of new technology in the pipeline, Samsung is betting that it will still be standing when these emerging segments of the automotive market mature. ◆
E/E Pioneer Ricky Hudi, from Audi to Future Mobility Technologies GmbH

In August 2016 Ricky Hudi left Audi, where he was the innovative carmaker’s top EE, and immediately founded his own international consulting company, Future Mobility Technologies GmbH in Regensburg, Germany. Unlike some other top execs who leave big jobs and begin consulting until they find other employment, Mr. Hudi will be with FMT for the long term. “I had a lot of fun before, but now I have a new freedom to shape the technologies of the future. That is what I really enjoy,” he said.

Mr. Hudi and his teams at Audi have been involved in many of our industry’s pioneering developments. They created the first multimedia interface (Audi’s MMI) in 2002, the first centralized gateway architecture in 2002, Audi’s modular infotainment system (MIB) in 2012, and Virtual Cockpit, a fully-digital HD graphics instrument cluster, in 2014. They also developed the first matrix LED headlight system and the industry’s first production 48-volt system, for the 2016 S-Q7. Another accomplishment Mr. Hudi noted was the world’s first real level-3 autonomous system, coming on the 2018 A8, which employs the zFAS central driver assistance controller.

An electrical engineer with a background in computer science and chip design, Mr. Hudi spent 26 years in the automotive electronics industry—seven years at BMW, followed by 19 years at Audi. We talked about our industry’s recent past and where he thinks automotive electronics development should be headed.

R&D investments by carmakers have lately been aimed at the three megatrends: connected car/infotainment, electrification and ADAS/autonomous driving. Approximately ten years ago investments in infotainment, connected car and the user interface were growing year by year to the point where carmakers were spending in the three-digit millions annually.

Roughly five years ago, ADAS development started getting a lot more attention. Spending there grew each year as premium carmakers built their portfolios of level-2 systems including adaptive cruise control, automatic emergency braking, traffic sign recognition, parking aids and lane keeping. In the last two or three years, carmakers have been making significant investments in autonomous driving. Mr. Hudi expects spending on AD will exceed past spending on infotainment and connected car.
Electrification is also getting a lot of attention, but investments in that sector are much smaller because software development is not nearly as big a component as it is with the other topics, especially autonomous driving.

Because the workload for each of these three development areas is so massive, some carmakers have organized the engineers working on them into separate departments. But these three megatrends have many challenges in common. They each require very big SOCs and high-bandwidth networks. Hypervisors need to be employed. Software modules from multiple vendors need to be integrated. Artificial intelligence is used for perception and decision making in autonomous driving; in the connected car it will be used to advance the speech interface. The adoption of 5G and the cloud must also be considered, as well as the establishment of “permanently evolving end-to-end security.” If the connected vehicle, autonomous driving and electrification development organizations are managed apart from each other, “big synergies could be missed,” cautioned Mr. Hudi.

R&D budgets are surely being stretched to cover these three key undertakings. As a result, more traditional fields in vehicle development such as engine, transmission, chassis and body engineering will have to shrink. “Funding these megatrend investments is a great challenge for all companies—the OEMs, suppliers and the big tech companies,” suggested Mr. Hudi. “This is why we are seeing so many new partnerships around the world. Especially for autonomous driving platforms, no company can do the investments by itself.”

**End-to-End Architecture**

Ricky Hudi has a clear idea about what mobility will look like in the future: “It is emissions free. It is completely free of accidents. Driving is fully autonomous and seamlessly connected with our lives.” As an alternative to owning a vehicle, consumers will have the option of selecting whatever car they want through a smartphone app. For this service they will pay a flat rate per month or perhaps pay per use. The car delivers itself autonomously to the user, and then drives away when it is no longer needed. “The major assignment now is integrating the vehicle into the daily life and needs of the customer and not the reverse,” said Mr. Hudi.

In order to support this vision, he is convinced a radically new, end-to-end architecture will be needed that links the embedded electronics systems in the vehicle with back-end systems in the cloud. The vehicle’s embedded domain computers will merge step-by-step into a single brain. For redundancy this central computing unit will be comprised of two “brain halves” connected by a high-speed data network.
Key technologies will need to be mastered such as gigabit Ethernet, virtualization, machine learning and sensor fusion. Data will have to be processed and compressed in the vehicle in order to limit the quantity of data that is streamed to the cloud.

Present relationships between carmakers and suppliers will be subject to great change. Today’s suppliers embed software in the ECUs they deliver. In the future the control devices and software will not necessarily come from a single source. Carmakers will purchase software separately from the ECUs and should remunerate software suppliers fairly.

FMT

“What I do now at Future Mobility Technology is not so different from what I did before at Audi,” said Mr. Hudi. “My main product is my executive and deep technological experience and my global network. Working with C-level executives, I help them develop technology and product strategies and answer technology management questions.” Mr. Hudi chairs the industry advisory board for HERE. He is a member of TTTech Computertechnik’s supervisory board and a member of the Open Innovation Advisory Board for Samsung. He also consults for Harman, now part of Samsung. ◆
Latest Kugler Maag Cie Survey Predicts Digital Services Will Radically Transform the Auto Industry by 2030

From January to June 2017, researchers from the Kornwestheim, Germany-based consultancy Kugler Maag Cie conducted more than forty in-depth interviews with E/E executives and managers from inside and outside the auto industry about the future of electrical and electronics development up to 2030. Here is some of what they learned.

Enabled by powerful computers, the Internet and vehicle connectivity, a digital transformation will redefine the automotive industry. Digital services will become a crucial ingredient with which the auto industry will provide future value. As digital services reshape the value proposition they will drive brand differentiation, and they will define the customer interface.

Autonomous and connected vehicles of the future will form ad hoc systems with other systems including other vehicles, infrastructure servers, IT and telecommunications systems, and the vehicles’ own subsystems. That is radically different from what has come before. To make this happen carmakers and suppliers will have to shift their focus from a product manufacturing frame of mind to service-based business models. Digital services will be a prerequisite for vehicle sales and market differentiation.

The combination of constant connectivity and the Internet will make it possible to add digital features to physical products. Such services will include finding parking spaces, predictive maintenance, or a feature such as one proposed by Audi, where the engine in a vehicle with start-stop is automatically started seconds before the traffic light switches to green.

Bonifaz Maag, co-founder of Kugler Maag Cie, is one of the study’s authors. “Today a carmaker designs a car, breaks it down into components, controls all of the engineering, collects and integrates all of the components, builds it, and then sells many copies of the car, and that’s it,” he said. “This will change in the future. We will have back-end services, data farms, and connection networks from telecoms in between. We will have data providers, for example, cities or infrastructure brokers.”
We have HERE and other map providers that will be essential to the functionality the driver perceives in the car.”

**Radically New Architecture**
Readers of the *Hansen Report* will be most interested in the radically different vehicle electrical and electronics architecture envisioned by the study. The figure below offers a framework for what it might look like in 2025. The new architecture will likely replace the centralized architectures that some carmakers are currently developing. “The fundamental idea is to have a layered architecture that is primarily driven by nonfunctional requirements geared to easy enhancements with regard to functionality,” advised Mr. Maag. “The architecture is connected to the Internet while adhering to system-of-system thinking and security requirements.”

**Digital Services Architecture**

In contrast with today’s component-oriented E/E architectures, where functions or parts of functions are allocated to the different ECUs, this new architecture will possibly have three layers such that the nodes (components) in each layer can be easily extended horizontally as needed.

Nodes in each layer will have the same nonfunctional requirements such as how many MIPS they can execute, the bandwidth of the buses and response times. While the functionality of the system can change over time, the physical architecture stays the same, which means standard hardware can be used. Designers will apply functionality to each node through software.

Source: Kugler Maag Cie

The Hansen Report on Automotive Electronics, September 2017

www.hansenreport.com
Each layer will serve different purposes. A core node is essentially a physical ECU that can carry several virtual machines. Edge nodes act as traffic aggregators. They transmit any data needed by the inner parts of the network, while keeping traffic that is local to the edge nodes local. The node terminology is borrowed from the telecom industry, Mr. Maag explained. In the third layer are the smart sensors such as cameras, radar and lidar, and detached devices such as displays and the door controller.

The survey, titled “Digital Capabilities for Automotive Innovators 2030,” builds on Kugler Maag Cie’s 2015 study, “Software Drives, Automotive E/E Development 2030.” (See the Hansen Report, July/August 2015.) The 2017 work was conducted in collaboration with the BMW Group, Bosch and the University of St. Gallen. It can be downloaded at www.software-drives.com.

Kugler Maag Cie
Kugler Maag Cie is a 70-person international consulting firm whose clients have included Bosch, BMW, ZF, Continental, Daimler and Panasonic. The majority of Kugler Maag Cie’s business is devoted to helping companies adopt functional safety, cybersecurity and Automotive SPICE software process requirements. “We help organizations master the challenges that come with automotive electronics. In the future that means helping companies transform from product-driven organizations to service-oriented organizations,” said Mr. Maag. ◆
The Company Profile: Vector Informatik

**Thumbnail Sketch**

**Headquarters:** Stuttgart, Germany; www.vector.com  
**2016 Sales:** €414 million  
**R&D:** More than 50% of sales  
**Largest Customers:** Bosch, followed by Daimler  
**Employees:** 1,830  
**Sales per Employee:** €226,230

**Background**

Vector Informatik was founded in 1988 as Vector Software GmbH, by Martin Litschel, Helmut Schelling and Eberhard Hinderer. The company name was changed in 1992. Vector is a leading producer of software tools, components and services for developing embedded systems. Its tools support networks based on CAN, LIN, MOST and FlexRay technologies, as well as a number of CAN-based protocols. Two of the company founders worked at Bosch in the early 1980s and were instrumental in the development of CAN technology. Mr. Litschel is one of the owners of the CAN patent.

In 2001, Thomas Beck joined Vector as its fourth shareholder and managing director. He came to Vector from ETAS, a Bosch software tools subsidiary, where he served as CEO since 1997. The three original founders stepped away from active management roles in the company in 2014. Today Dr. Beck and Thomas Riegraf, a 27-year veteran of Vector, share managing director responsibilities.

Broadly speaking, Mr. Riegraf’s product responsibilities lean more toward test and validation, while Dr. Beck’s are more in the areas of design, implementation and embedded software. He is also responsible for global sales.
About 95% of Vector’s sales are to the automotive industry. That figure is likely to decline by several percent as Vector picks up business in aerospace and medical as a result of its recent acquisition of Vector Software, whose testing tools for safety-critical systems are used not only in automotive, but other industries as well.

Not at all focused on short-term profits, in 2016 Vector spent 50% of sales on R&D. That is quite a bit higher than almost every other automotive electronics supplier.

To account for the double-digit growth rate of its sales, Vector points generally to a solidly growing market for software tools. “It’s not only Vector that is growing,” said Dr. Beck. “Our competitors are also benefiting from this market.” Asked for the reason why customers choose to do business with Vector, he said, “We take care to confirm that our solutions are really supporting the engineers who use them. We work together on joint projects and listen to our partners.”

Dr. Beck is confident that Vector is well positioned for the future with numerous new products in the pipeline that will sustain the company’s growth. His concerns are more about the future of the overall automotive industry, for example, if the number of cars produced each year will continue to climb or decline. “Many young people are not so much interested in owning cars and would rather rely on public transportation,” he observed. “Cars last a lot longer than they used to. Will OEMs therefore sell fewer of them each year as a result? Will the budgets to develop new cars be cut?”
**PREEvision**

PREEvision is the lifecycle management tool first envisioned by Vector in 2001 as “the SAP for the technical development process of embedded systems.” The PREEvision brand was created by a Karlsruhe-based company called Aquintos, which Vector acquired in 2010. PREEvision 5.0 was released in 2011.

Released in August 2017, PREEvision 8.5 extended support of service-oriented architectures (SOA) and Ethernet networks. PREEvision provides functions for both classic and service-oriented architecture development, requirements management, network design, safety-related system design, Autosar system and software design, and wiring harness development. PREEvision supports the system engineering principles of abstraction, decomposition and reuse.

Nearly 1,000 engineers at Volvo are using PREEvision’s predecessor tool to collect requirements and execute logical design of the complete platform. The system is also used to generate Autosar files, as well as for network design and collecting test data.

A comprehensive tool for model-based development, PREEvision is attracting more customers. Presently in rollout phase are John Deere, a large French/Japanese OEM and the Daimler bus maker, EvoBus. BMW is

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**Vector’s Main Competition**

- Wiring harness design tools: Mentor Graphics and Zuken
- Validation and testing: dSpace and ETAS
- Calibration systems: ETAS
- Embedded software: Elektrobit

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**Benefits of PREEvision**

- Design, management and documentation of complete E/E systems in one tool
- Integrated traceability
- Graphical modeling in diagrams
- Full support of Autosar methodology
- Design of safety-relevant systems according to ISO 26262
- Variant and product line management
- Complete development from architecture to wiring harness based on one source
doing an integrated approach for E/E architecture development and the complete wiring harness design in one seamless PREEvision model. The development organization from Daimler Car for E/E Architecture, E/E Systems and E/E Components has selected PREEvision 8.5 as the engineering backbone for its next car platform. Other customer bookings, which can’t yet be disclosed, will soon follow.

The tool’s main advantage is that it allows engineers to collaborate with each other more easily. With PREEvision’s model-based approach the requirements are linked with the logical design, which is linked with the network design, the software and service architecture, and the hardware architecture, down to the wiring harness. “There is no tool at the moment that is competitive with PREEvision,” asserted Dr. Beck. “Another PREEvision feature is the availability of a rich set of data models, from high-level requirements down to wiring harness.”

Because carmakers stick with their adopted tool chains for a long time, making tool turnover infrequent, Vector’s PREEvision business will continue to build very slowly. “But once a customer is aboard, that business can last as long as 20 years,” Dr. Beck added.
Adaptive Autosar Stack
Vector plans to begin delivering its complete Adaptive Autosar software stack to customers in time for planned production starts by German carmakers in 2019. The main trigger for the requirement to deploy Adaptive Autosar software, according to Dr. Beck, is its support for multicore processors. That support will be required as carmakers adopt centralized architectures that integrate multiple infotainment, ADAS, autonomous driving, and even body control ECUs. A complement to Classic Autosar, Adaptive Autosar will enable use cases that Classic Autosar cannot accommodate, for example, high-speed communications, cybersecurity, diagnostics, service-oriented architecture and cloud-based applications.

While other companies will also offer embedded Adaptive Autosar software, Dr. Beck believes Vector will have an advantage in its ability to deliver a complete system that includes the Autosar software and an operating system, namely PikeOS from Sysgo. Well suited to high-performance computers, PikeOS is a Posix real-time operating system that is compliant with ISO 26262 ASIL D safety requirements. It features a separation kernel-based hypervisor with multiple partitions for other operating systems and applications. Founded in Germany, Sysgo is a subsidiary of Thales Group, a French aerospace, defense and transportation company.

The first carmakers to employ ECUs based on Adaptive Autosar are likely to be the German carmakers BMW, Daimler and Volkswagen Group.

Competition could come from a Linux operating system. The Automotive Grade Linux consortium is working on a safety-critical version of Linux, but Dr. Beck has his doubts that that effort will come to much. “It is not possible to apply the same methods to Linux that have been applied to any ASIL D rated software. They would have to take a different path by deploying it over many miles of operation and then saying it is proven safe by application.”

Software for OTA Connectivity
Vector has been investing heavily in R&D projects to significantly build up its portfolio of software components that support over-the-air services. Some of those components will be embedded in the vehicle; others will reside on OEM servers in the cloud. A number of connectivity products will be introduced to the market over the next couple of years.

In-Car Networks
Two of Vector’s biggest products are CANoe and CANalyzer, which are tools for developing and analyzing networks. While two of Vector’s
founders were instrumental in the development of CAN when they were at Bosch, these tools are used not only for CAN but also for LIN, MOST, and FlexRay networks. They also support testing of Ethernet networks.

The automotive industry is in the process of replacing many CAN networks with Ethernet networks. Ethernet communication is much faster than CAN, and because Ethernet is widely used in computing and elsewhere, its economic ecosystem is large. Whether carmakers use CAN or Ethernet is of little concern to Vector. Its network tools business will be strong either way. “We are ready to support the demand for Ethernet capability,” said Dr. Beck. “Big portions of the car will run on Ethernet without completely replacing CAN. Carmakers will start with 100 megabit Ethernet and then move to one gigabit Ethernet. Beyond that would be overkill.”

Ethernet will also factor into the demise of MOST and FlexRay. “I am not aware of any new developments based on MOST,” said Dr. Beck. “It will be replaced by Ethernet.” While FlexRay may still find uses in some time-synchronous, distributed-control applications such as in suspension damper control systems, time-sensitive network versions of Ethernet may even replace this FlexRay application.

FD or Flexible Data Rate CAN, which provides a higher data rate than CAN, is being widely adopted, according to Dr. Beck. It is being used both to flash ECUs on the production line and for communications between ECUs.

**Service-Oriented Architecture (SOA)**

Vector has been working on changes to CANoe and CANalyzer so that they now support the development and testing of service-oriented architectures. Along with the shift to centralized computer architectures, which rely on high-performance multicore processors, Vector is seeing a paradigm shift from embedded code that is static to service-oriented architectures. “Automotive software will soon look more like business systems,” suggested Dr. Beck. “Some of Vector’s own tools are already built using SOA, so we are familiar with it.”

Adapting to service-oriented architectures will not happen overnight in the auto industry. “While the software engineers coming into the auto industry today from universities are well educated in computer science, we still have many, many older engineers who have to get trained in the topic,” Dr. Beck noted. “Unlike classical automotive systems, where everything is designed from the beginning, with each CAN message
defined, with SOA you are able to replace a service or add new ones without disrupting everything that has already been implemented in the car.”

The carmakers most likely to be early adopters of service-oriented architectures will probably be the same carmakers who have decided to adopt Adaptive Autosar.

**Acquisition of Vector Software**

In January 2017, Vector announced the acquisition of the U.S. company Vector Software, based in East Greenwich, Rhode Island. Vector Software is a tools company with sales of approximately $20 million and more than 90 employees. The company’s main product is the VectorCAST test automation platform, used to validate software in safety-critical systems. The tools are capable of white-box testing, able to analyze the code within each system. The company serves the automotive, aerospace, and medical-device industries among others. The “Vector” name is a coincidence; the two companies were not affiliated prior to the acquisition.

**Diagnostics Products**

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<th>Specification/Creating Diagnostic Data</th>
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<tr>
<td>CANdelaStudio</td>
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<tr>
<td>User-oriented specification of ECU diagnostic data based on templates. Import and export of ODX data is supported.</td>
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<tr>
<td>ODXStudio</td>
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<tr>
<td>Authoring tool for conveniently viewing, editing and comparing diagnostic data in ODX 2.0.1 and 2.2.0 formats</td>
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<th>ECU Software Components</th>
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<td>CANdesc</td>
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<td>Generates software components for diagnostics—fast and proven integration of diagnostics into ECUs</td>
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<td>MICROSAR DIAG</td>
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<td>Autosar basic software for Diagnostics: DCM (Diagnostic Communication Manager) and DEM (Diagnostic Event Manager)</td>
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<th>Diagnostic Tester</th>
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<td>Indigo</td>
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<td>Quick and especially easy-to-use diagnostic tester for single ECUs or the complete vehicle</td>
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<td>CANoe.DiVa</td>
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<td>Automated validation of diagnostic implementation in ECUs with data driven test case generation</td>
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<td>vFlash</td>
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<td>Flashing of ECUs via CAN, CAN FD, LIN, FlexRay, and Ethernet (DoIP)</td>
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<td>Engineering services related to diagnostics: from creating diagnostic data to the customized comprehensive solution</td>
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The Hansen Report on Automotive Electronics, September 2017

www.hansenreport.com
Consumers Place High Value on Safety Features

Premium carmakers have always led the way in pioneering brand-differentiating features and technology. That trend continues in 2018. The 2018 Mercedes S and E class vehicles, for example, include an updated Linguatronic voice control system that extends voice control, previously limited to infotainment features, to some vehicle functions as well, including climate and comfort features. On the E class, pre-scripted commands are resident in the onboard vehicle software, including several hundred alternatives for each command. Daimler believes this will increase the likelihood the user will hit on a valid command phrase on the first try. For example, saying “massage me” will activate the seat massage function.

Growing in the luxury segment too are remote parking functions that allow drivers to park the car in a garage or on the street with a smartphone app. The BMW 5 series includes INRIX’s On-Street Parking service, an industry first according to INRIX, to use historical and up-to-the-minute parking data to predict the availability of parking spaces. As of July 2017, the service was only available in 16 cities in the U.S. and Germany, with more to come later this year.

The all-new 2018 Audi A8 is the first production model to employ a lidar sensor, in this case a mechanical lidar from Valeo mounted in the grill, as part of the sensor array that enables Audi’s Level 3 AI Traffic Jam Pilot. Traffic Jam Pilot operates at speeds up to 37 mph with no supervision unless the system requests driver intervention. Also included are 12 ultrasound sensors, five cameras, five radar sensors and one IR camera for night vision.

Safety First
ADAS features once limited to premium cars continue to percolate down to more mainstream high-volume vehicles. For example, the all-new B-segment Nissan Micra (not sold in the U.S.) has standard-fit autonomous emergency braking. Micra models with (optional) pedestrian detection earned a five-star Euro NCAP rating. Autonomous emergency braking and lane-change assist are available on the low-priced Hyundai Accent compact. Small SUVs, which in 2016 accounted for 32.2% of U.S. light vehicle sales according to WardsAuto, offer a variety of standard-fit safety features, but among IIHS’s top safety picks, front crash protection remains an option or is limited to higher trim lines in many of the most popular brands. The exception is Toyota’s RAV 4, where it is a standard feature.
Consumers have had several years to experience and become familiar with safety features that for the most part perform as advertised. Stomp on your brake pedal and your antilock braking system adjusts brake force as needed to prevent your tires from skidding. Drift out of your lane and you will be warned or assisted back in. Recent consumer surveys have found that the features people most want are those that will keep them safe on the roads.

Research conducted in the U.S., Canada, the U.K. and Germany by IHS Markit found that blind-spot detection was the most desired feature among respondents, throughout all age groups.

Deloitte’s 2017 Global Automotive Consumer Study polled consumers in the U.S., Germany, Japan, South Korea, China and India about their feature preferences. In all six countries, safety features comprised the top four that consumers deemed most useful.

Consumers Wary of Full Autonomy
Despite progress in autonomous driving technology, consumers are not yet convinced of the safety benefits that self-driving cars could provide. The J.D. Power 2017 Tech Choice Study found that, with the exception of Gen Y (people born between 1977-1994), U.S. consumers’ trust of autonomous vehicles has actually declined since 2016. In the Boomer segment (born 1946-1964), 40% of respondents saw no benefit at all to self-driving vehicles. According to J.D. Power, consumers are concerned about the complexity of autonomous driving systems as well as privacy issues and the risk of the car being hacked.

IHS Markit’s research found that just 44% of all respondents thought full autonomy would be a desirable feature on their next car. China was the outlier, with 72% of respondents wanting full autonomy in their next vehicle. Just over

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<th>Consumer Willingness to Pay for Features</th>
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<td><strong>Full Autonomy</strong></td>
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| Note: All figures converted to USD for comparison |

Source: IHS Markit
half of U.S. consumers rated full autonomy a feature they wanted. IHS also discovered that even though autonomy was not among the most desired features, it was the technology that consumers would be willing to pay the most for. But until the technology matures, the amount they are willing to pay is far from sufficient.

GM’s Super Cruise autopilot for highways, with driver attention monitor and lidar map data, debuts on the 2018 Cadillac CT6. Super Cruise will be standard on CT6 Platinum models and available as a $5,000 option on the CT6 Premium Luxury model.

Deloitte’s survey found that a high percentage of consumers in all regions feel self-driving vehicles will not be safe. The percentages of those who feel that way range from 62% in China to 81% in South Korea. The U.S. and Germany fell in the middle of that range at 74% and 72%, respectively. ♦