HMI CHALLENGES
How is it possible to deliver all of today’s automotive technology to the car driver in a safe and logical way? Connected Car not only talks to Bentley, Robert Bosch, BMW, Harman, Intel and Volvo Cars, but also one of the young minds that could steer future developments.

AUTOMOTIVE AT CES 2017
Full video reports from the Las Vegas tech Mecca.

TOP MOBILE HANDSETS BY REGION
Full listing of Q1 handset releases for Europe, North America, China & Japan.
FROM THE DRIVING SEAT

Hello, and welcome to the latest issue of Connected Car magazine. It seems only a short time ago that we were throwing our tripods over our shoulders and heading for Las Vegas to attend CES – the Consumer Electronics Show. For the last few years this enormous event has featured prominently in the calendars of major car companies and automotive tech developers alike. While not yet rivalling the auto shows in places like Detroit, Chicago, Frankfurt and Geneva, CES 2017 nonetheless attracted nine automotive manufacturers, 11 tier-one auto suppliers and more than 300 vehicle tech-related exhibitors took part in CES 2017. Sadly, one company at the forefront of automotive tech development – Audi – did not appear at CES this year.

The focus for the automotive companies attending CES, is – of course – technology, which means that for this particular publication, CES is a perfect place to meet up with the car companies and tier 1 suppliers. We may be petrolheads at heart, but when it comes to creating this magazine we’re not interested in tyres, engines, exhausts and fabrics. The tech focus is, then, why we’re always excited to attend CES.

This year was no exception. Prior to heading out to Las Vegas we did our research, and made arrangements to meet with some great companies, including Bose, Continental, Ford, Harman, the Genivi Alliance and the Open Connectivity Foundation. We created some great video features, and these can all be seen on pages 6 & 7.

Our other major feature in this issue examines the automotive human machine interface (HMI). We are lucky to be able to experience many of today’s latest systems in press cars loaned to us by manufacturers. Without exception, car companies today are competing to integrate ever-more complex technology, in the first instance to attract customers with gizmos and wizmos, but then as a precursor to semi- and then fully-autonomous driving.

We are finding that a tech overload is developing. So many advanced systems are being integrated today that it is hard to understand how drivers – many of whom are still struggling to come to terms with the disappearance of CD slots in their dashboards – can be expected to cope. The HMI is intended to manage driver interaction with the cars systems. However, we and many others feel that today this just isn’t working. As senior journalist Matt Prior of Autocar, the UK’s number 1 weekly consumer car magazine, said last week “There comes a point, you see, when you have removed so many buttons and replaced them with icons in sub-menus on a touchscreen that, quite frankly, it becomes almost completely unusable while driving. It’s almost – and I choose this word carefully – dangerous”. Too right, Matt. I completely agree.

This magazine isn’t aimed at consumers, it is aimed at the automotive industry and is therefore a chatroom for insiders to discuss major issues such as this. And maybe to face up to some realities that they are choosing to look away from at the moment. We invited an important but also eclectic group of industry organisations to comment on this really, really important issue. Our HMI feature runs across 11 pages. If you want to comment, or have strong views, contact me using the details on this page.

Vince Holton
Editor
Connected Car

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## CONTENTS

### FEATURES

6  VIDEO FEATURE: CONNECTED CAR AT CES 2017
Connected Car meets with OEMs and Tier 1 automotive technology developers at the world’s largest consumer electronic show. See our full video report.

10  FEATURE SECTION: THE AUTOMOTIVE HUMAN-MACHINE-INTERFACE (HMI)
Connected Car talks with key players developing and commercialising the various levels of HMI in today’s vehicles. Is today’s HMI safe? Does it work? What does the future hold?

12  INTERVIEW: HARMAN
Recently acquired by Samsung, Harman says that its engineers design solutions simplifying the way people interact with technology and connecting them to the world around them. That must mean the HMI …

14  INTERVIEW: VOLVO
Connected Car experienced Volvo’s vision for the HMI via Sensus in an XC90. Since then it has been updated. We spoke with David Holoczek, and sampled Sensus again in the new S90.

15  MILLENNIAL VIEWPOINT
OK, so the grown-ups at the car companies have their views on the HMI, but what about the people who are likely to be running the car industry in the future? We talk to masters degree graduate Sonja Malovsič.

16  INTERVIEW: ROBERT BOSCH
Bosch’s Iain Jacobs believes that judgement regarding the safety of a given HMI is often left to the discretion of industry experts, which creates an element of subjectivity. Would standardisation be beneficial?

18  INTERVIEW: INTEL
Intel showed connected cars at tech events in the late 90’s. This interview makes it clear that automotive tech is a huge part of the semiconductor giant’s roadmap today, but what are its views on the HMI?

20  INTERVIEW: BENTLEY CARS
Luxury cars are typically the first to see the latest developments in HMI. What is happening in the rarefied air at the top of the market? We spoke to Bentley’s Graeme Smith.

### INDUSTRY DATA

28  Access quarterly updated tables listing the cellphones that car manufacturers should be most aware of, region by region.

### EVENTS

30  A calendar of significant connected car events happening around the world.

### SUBSCRIBE

31  Subscribe free of charge to Connected Car magazine.
HERE WELCOMES BMW TO THE OPEN LOCATION PLATFORM

HERE has announced that BMW Group is the first automaker to utilize the HERE Open Location Platform for the development and launch of its new digital driving services.

By leveraging the next generation of its platform, HERE suggests that BMW has the possibility to create differentiated location-enriched services from the data generated by its connected cars and the HERE data ecosystem. For example, it will be able to combine car sensor data with other data streams available through the platform, such as from cities and the broader Internet of Things, and build services using a powerful framework for geodata processing. In the first wave, this will help vehicles to better detect, process and validate fleet sensor data related to hazards on the road, variable speed signage location and values, and physical road dividers.

Peter Kürpick, Chief Platform Officer, HERE, told Connected Car, “The raw data crowd-sourced from car sensors becomes more valuable when you have contextual information for that data. Our analytical tools provide that rich location context giving BMW and other automakers the ability to turn their data into differentiating services that elevate the driving experience.”

HERE says that it is offering new possibilities to harness sensor-based information with the HERE Open Location Platform. The platform apparently also provides secured environments, enabling participants to work with their data either in isolation from others or with selected parties with whom they have agreed to share data and create collaborative services. For example, BMW is among three automakers submitting car data for use in new real-time sensor-based services created by HERE and launching in 2017.

“We are already shaping the industry ecosystem. Together with HERE and in combination with our partner Mobileye, announced recently, we are creating an essential nucleus on the Open Location Platform for self-healing HD maps required by autonomous driving,” said Stefan Butz, VP of Location based Services within BMW. “The platform empowers our developers with a rich feature set to easily analyze data and develop cloud based location services with short time-to-market cycles for our customers.”

ERICSSON CONNECTED VEHICLE MARKETPLACE

Ericsson launched its Connected Vehicle Marketplace (CVM) at Barcelona’s Mobile World Congress and confirmed its first CVM customer – Swedish heavy goods vehicle (HGV) maker, Scania, with its launch of ‘Scania One’.

CVM is a white label solution aimed at reducing the complexities of building digital service ‘ecosystems’ for the growing global population of connected vehicles. The connected fleet of Scania trucks already numbers 250,000 units – amounting to two-thirds of all Scania vehicles sold in the past five years.

Scania One is a digital, open customer platform that gives fleet owners, drivers and fleet owners’ customers, access to services and data to include fleet management, route planning, transport flow, fuel economy, optimum driving style and more – all developed, says Ericsson, to increase efficiency, safety and productivity.

Building on the Ericsson Connected Vehicle Cloud, Ericsson describes CVM as a controlled and secure environment for vehicle manufacturers to provide new digital services for their drivers’ perusal, and in turn, deepen the relationship between manufacturers, vehicles and drivers.

CVM provides access to data allowing manufacturers to securely deploy – via secure streaming – a number of applications, services and content to vehicles and drivers. Network reliability and performance is managed by Ericsson, allowing manufacturers and partners to focus on innovating.

VISTEON ACCELERATES SHIFT TO ALL-DIGITAL VEHICLE COCKPIT

Visteon Corporation showed its latest instrument cluster and display technology at CES, including a range of production-ready, fully digital instrument clusters and displays that incorporate premium graphics and illumination, and which, the company said, took advantage of the enhanced styling freedom that digital clusters afford.

Fully reconfigurable instrument clusters are expected to represent up to 80 percent of the market within five years. “As more digital content comes into the cockpit, instrument clusters that were first largely mechanical and then evolved into electromechanical and hybrid devices are now transforming into fully digital display-based clusters,” said Visteon President and CEO Sachin Lawande.

“There is also considerable interest in integrating displays more naturally into the design and materials of the instrument panel, using free-form shapes with no visible display active areas.”

At CES, Visteon displayed a range of instrument clusters from entry level to premium, featuring the latest in large, high-resolution displays, including 3-D, all-digital, hybrid digital/analog and a cluster with integrated cameras for facial recognition and monitoring. Highlights included a prism display, which uses two 12.3-inch TFT displays with a semi-reflective “blade” between them.

Featured information displays included dual OLED (organic light-emitting diode) and dual-view displays that show different content based on viewing angle – such as navigation for the driver and video for the passenger.
GENIVI ALLIANCE AND OPEN CONNECTIVITY FOUNDATION COLLABORATE ON OPEN STANDARDS IN VEHICLE CONNECTIVITY

The GENIVI Alliance and the Open Connectivity Foundation (OCF) have announced a liaison agreement that will see the two organizations co-develop open standards for vehicle connectivity and vehicle data exchange, including a unified framework for secure discovery and exchange of information between smart homes, connected cars and other IoT devices.

The joint effort will also address end-to-end security challenges and, according to the two organisations, will be the basis for a growing number of V2X (Vehicle-to-everything) solutions, enabling new opportunities across multiple verticals.

GENIVI and OCF will also closely collaborate with the W3C Automotive Working Group, which develops an Open Web Platform API specification, to expose vehicle data to web application developers.

At CES 2017, the two organizations demonstrated a smart home gateway that featured vehicle-to-smart-home connectivity utilizing GENIVI Remote Vehicle Interaction (RVI), Vehicle Signal Specification (VSS) and OCF’s IoTivity technologies (see the Connected Car magazine video of this demo on p6-7 of this issue). The demonstration displayed various approaches on how connected vehicles can interact with IoT and the smart home.

Joonho Park, executive director of OCF commented, “OCF believes in technology partnerships that will help drive our vision of ensuring secure interoperability for consumers and business, across multiple industry verticals. We are excited about today’s announcement which helps us build on our momentum to deliver specifications and open source components that will benefit the entire IoT ecosystem. We’ve had a productive, year-long collaboration with GENIVI, resulting in open source contributions to key IoT projects and technology demonstrations at CES 2017 that were received extremely well by attendees.”

QUALCOMM AND LG BRING 5G AND CELLULAR-V2X COMMUNICATIONS TO VEHICLES

Qualcomm Technologies and LG Electronics (LG) have announced coordinated efforts to facilitate testing and adoption of 5G and Cellular-V2X (C-V2X) communications into vehicles. Qualcomm Technologies and LG expect to showcase these next-generation wireless technologies through trials during the first half of 2018. The two companies delivered their first telematics system in 2004.

On the path to 5G, LG is developing advanced automotive connectivity solutions based on Qualcomm Technologies’ connected car platform, which features support for Gigabit LTE speeds using the Qualcomm Snapdragon X16 LTE modem, and is complemented by the QCA65x4 Wi-Fi 802.11ac solution. The connected car platform also supports 802.11p/DSRC and C-V2X, based upon 3rd Generation Partnership Project (3GPP) Release 14 specifications.

With a strong evolution path to 5G, C-V2X technology is said to be a key feature for safety conscious and autonomous driving solutions, complementing other Advanced Driver Assistance Systems (ADAS) sensors, such as cameras, radar and LIDAR, to provide information about the vehicle’s surroundings, even in non-line-of-sight (NLOS) scenarios. In addition to allowing for 360 degree NLOS, C-V2X is also designed to allow for enhanced situational awareness by detecting and exchanging information using direct communications in the 5.9GHz ITS band with other vehicles, infrastructure and pedestrians’ devices, as well as network-based communications to cloud services using commercial cellular bands. Compared to current technologies, Qualcomm claims that C-V2X is designed to deliver enhanced V2X direct communication range, reliability, latency and superior NLOS performance. The technology is supported by a broad ecosystem based on 3GPP Release 14 specifications, with trials expected to begin later this year.

BACK TO THE FUTURE FOR FORD CUSTOMERS

Millions of owners of older Ford cars in the USA stand to benefit from Ford SmartLink, a technology that enables connectivity features normally only available on new modem-equipped vehicles. Using a device that plugs into the OBD II port below the steering wheel, Ford SmartLink will give customers who own 2010 – 2016 model year Ford and Lincoln vehicles that are not equipped with a modem access to:

• Smartphone-based remote start, lock and unlock.
• 4G Wi-Fi hotspot capable of accepting up to eight devices.
• Vehicle health and security alerts.
• Vehicle location assistance.

Stephen Odell, executive vice president, Global Marketing, Sales and Service told Connected Car, “Ford SmartLink will surprise and delight owners of recent model-year vehicles by adding some of today’s most popular connectivity features. Offering it through our dealerships is another way to keep us connected with our customers and earn their loyalty.”

SmartLink can be obtained at Ford and Lincoln dealerships starting this summer. With more than two years of research and development invested, Ford says that its SmartLink team of engineers, in collaboration with Delphi Automotive and Verizon Telematics, have ensured the technology will work seamlessly with Ford and Lincoln vehicles.
Once again, the car companies showed that the Consumer Electronics Show is not just about phones, TVs, computers and smart home technology.

FCA, FORD, MERCEDES, BMW, VOLKSWAGEN WERE AMONGST THE MANUFACTURERS SHOWING NEW SELF-DRIVING SYSTEMS, ELECTRIC CARS AND NEW USER INTERFACES. Highlights included Ford announcing that it is adding Alexa to its cars (see Connected Car video interview), BMW showcasing a HoloActive Touch system, while Mercedes told the world it is partnering with Nvidia to build an AI-powered car and also showed an all-electric SUV called the EQ. Meanwhile, start-up Faraday Future showed what will apparently be its first production car the FF91, which the company claims will have a range of 378 miles and a 0-62mph time of 2.39 seconds. But maybe not both at the same time.

And there was much more – a new electric minivan from Fiat Chrysler, a new Leaf from Nissan and a concept vehicle from Honda called the NeuV, which is self-driving and aimed at ride-sharing.

According to the show’s organisers, nine automotive manufacturers, 11 tier-one auto suppliers and more than 300 vehicle tech-related exhibitors took part in CES 2017.

Once again, the Connected Car film crew was at CES, and we met with Ford, Bose, Harman, Continental and the GENIVI Alliance to complete the video features you see on these pages. CES may be a maelstrom of activity, but there is no doubt that this is a great opportunity to meet with leading players from across the automotive sector, and to see and learn about the latest tech developments, all in one town and all at the same time.

Will CES continue to grow its role as a venue for car company announcements? We don’t know, but we will surely be there again in 2018 to find out.

In the meantime, please enjoy our CES 2017 video features.

1. FORD: SYNC, SMARTDEVICELINK AND ALEXA.
We met with Alex Muller, AppLink Engineer, Connected Vehicle & Service at Ford’s Research & Innovation Centre. Alex has been personally involved with AppLink’s development and was ideally positioned to talk us through Ford’s growing reach with SmartDeviceLink, and the significance of bringing the Alexa personal assistant into the car. Alex was brave enough to demo Alexa in the hugely noisy show environment, and – amazingly – it worked!

2. BOSE: BEYOND AUDIO
We all know Bose as a company behind some great audio products – for the consumer and for the car – but not many know that Bose is developing systems that will enhance and augment the connected and autonomous vehicle experience. We spoke with Jim Parison, Distinguished Engineer, Bose Corp., who explained how his company is developing systems based around Bose’ core competencies in the audio sector – the mathematics of vibration and electromagnetism – and how this expertise is now being channelled into Bose Ride.
HARMAN: CONNECTED SERVICES AND CYBER SECURITY
Connected car made two movies with Harman, which were as follows:

3. HARMAN CYBER SECURITY DEMO –
We all know that security of vehicle data is a massively hot topic, and that consumers are genuinely worried about the prospect of their connected vehicle being hacked. Harman is tackling the problem head-on with ECU Shield, TCU Shield and Alerts Monitor, as demonstrated by Dvir Reznik, Senior Marketing Manager, Automotive Cyber Security at Harman.

4. HARMAN CONNECTED SERVICES –
Oren Betzaleli, VP & GM, Software Platforms Product BU, Connected Services at Harman talks us through the work of the Connected Services business, which develops software for the Cloud, analytics, device management and the Internet of Things, and his company’s latest announcement – Harman Ignite.

5. CONTINENTAL: SMART MOBILITY
If there was a competition for how many different demonstrations a company could stage at CES, Continental would likely be up there on the winner’s podium. Connected Car talked with Alex Zlotz, Director, Advanced Development, Interior Systems & Technology at Continental as he explained how Continental is making mobility smart, more efficient and safe. Innovations included OTA updates via satellite networks, e-horizon for the connected motorbike, Traffic Light Assist, Remote Code Key, Comprehensive Environment Model and a demonstration of High Resolution Flash LIDAR.

6. GENIVI ALLIANCE DEMO WITH OPEN CONNECTIVITY FOUNDATION
Connected Car magazine meets with representatives of the GENIVI Alliance and sees a fascinating demo involving a Jaguar F-Type and smart tech from GENIVI, Samsung, Jaguar Land Rover and the Open Connectivity Foundation.

SEE MORE VIDEOS AT www.connectedcarmag.com
TOYOTA AND NTT AGREE COLLABORATION ON ICT PLATFORM DEVELOPMENT FOR CONNECTED CARS

Toyota Motor Corporation and the Nippon Telegraph and Telephone Corporation (NTT) have agreed to work together on connected car technology. Their aim is to address a range of issues, including traffic accidents, congestion and the delivery of new mobility services, to help realise a future worldwide Smart Mobility Society. A field trial is planned for 2018 to assess the feasibility and usability of representative services for connected cars.

Areas of collaboration include:

- A platform for data collection, accumulation and analysis: Toyota and NTT will create technologies for building and administering a platform for the collection and accumulation of information and data from large numbers of vehicles. This platform will also enable the distribution of data and the real time processing and analysis of Big Data.
- IoT (Internet of Things) networks and data centres: the collaboration will include the study of global network infrastructure topology and optimal data centre deployment.
- Next generation communications technologies – 5G and edge computing: studies will be undertaken to determine the best mobile communications system to deploy. Systems will undergo connection tests to determine the best mobile communications system to deploy.
- Systems will undergo connection tests to promote the standardisation of 5G for road vehicles.
- Agents: technologies will be developed to provide drivers with user-friendly services, combining driver advice based on what is happening inside and outside the vehicle, voice interaction technology and other technologies, using AI (artificial intelligence).

Toyota’s role in the collaboration is to research and develop an ICT platform for connected cars, aimed at creating new and better mobility services, drawing on its knowledge of how vehicles are used and vehicle data requirements.

YOUNG PEOPLE TO LEAD THE CONNECTED AND AUTONOMOUS VEHICLE REVOLUTION

Connected and autonomous vehicles (CAVs) will transform the lives of more than seven out of 10 young people, according to new research published by the UK’s Society of Motor Manufacturers and Traders (SMMT).

The research shows CAVs have the potential to significantly reduce social exclusion. 71% of survey respondents aged between 17 and 24 said this new technology would improve their quality of life. Meanwhile, 69% said they feel positive about CAVs, with almost half (49%) saying they would get in one today if they could.

Automatic braking and parking and the car’s ability to self-diagnose faults were cited as key attractions of CAVs, contributing to a reduction in driving stress – the biggest attraction of owning a CAV among this group. Meanwhile, connected entertainment features such as music and video streaming were also appealing. Freedom to travel spontaneously and socialise with friends and family were also seen as life-changing benefits.

Mobility is a challenge for many young people, with more than a quarter (29%) saying the cost of car ownership, particularly high insurance premiums, restricts their freedom. They also cited the high cost and infrequency of public transport as a barrier.

Although fully connected and autonomous vehicles aren’t expected to become mainstream until 2030, most new cars are now connected via sat nav or Bluetooth, and more than half are available with safety systems such as collision warning or autonomous emergency braking.

DIGITAL TRANSFORMATION OF THE AUTOMOTIVE INDUSTRY BRINGS NEW REVENUE STREAMS

Researchers at Frost & Sullivan believe that the rapid pace of digitalisation is transforming the component hardware-driven automotive sector to a software- and solutions-focused industry. In future, the company says, all aspects of the mobility value chain will be digitalised: From the shortening of product life cycles due to higher software dependency, over the transformation of car dealerships to the actual sales process and maintaining the relationship with the customer – everything will be coined by the opportunities and challenges digitalisation offers. Frost & Sullivan breaks this overall trend down into five pillars: The Future of Mobility and OEM mobility strategies, Industry 4.0, connected and autonomous car, digital retailing, Connected Supply Chain and Mobility as a Service (Maas).

Today already, 40 million people use app-enabled carpooling services, and the usage of ride-hailing apps has grown rapidly to over 70 million users. Consumers’ evolving digital lifestyle expectations and demands for new and innovative services will affect all components of the digitalisation of the industry, however, it will be most visible within the emergence of Mobility as a Service (Maas).

Increasingly, a readiness to combine different modes of transportation is shaping the industry.

The lines between public and private transport are becoming blurred, says Frost & Sullivan, in favour of a multi-modal integrated transportation system encouraging the emergence of models such as smart ticketing, multi solutions and aggregated booking.

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Introducing ATAM from NextGen – an innovative new solution to address the challenges of validating interoperability between mobile, media, computing and communications devices.

- Automated Testing for all CE Devices
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- High volume repetition testing
- Modelling of complex use cases.
In our previous issue we included a review of Audi’s Virtual Cockpit and Audi Connect in a current spec A4 saloon. You can watch the video by clicking on the movie screen shown on this page. We were very impressed by the range of talents of both systems, but the process of creating our video report did help crystallise a growing concern. That is that no matter how clever, how effective, how well-developed and how good-looking systems such as Audi’s may be, if they are not easy to use they won’t be used by the average car driver. What’s more, using these systems can at least distract the driver and potentially put them in danger. This is the subject of this feature section.
The need for a competitive advantage, coupled with the rush towards autonomous driving, is forcing the OEMs to cram ever-more complex technology into the car. Where previously a driver’s toughest challenge was whether to press a radio-station pre-set button or insert a CD into a slot, life is much, much more complicated now.

Perhaps the tripping point was Bluetooth. For all of the wonders that that wireless technology has enabled, it’s also at the heart of the most widely-reported customer satisfaction complaints – Bluetooth-based pairing and usage problems in new cars. Ask J D Powers.

Car drivers have demonstrated a clear and present inability to cope with technology in cars, yet Bluetooth is, today, only one element of the tech challenge. While infotainment systems have become more complex and Apple CarPlay, Android Auto and other screen replication systems have allowed drivers the frightening prospect of endless apps popping up on their dashboards, a blizzard of new technology enabling ADAS systems has also landed upon the car platform.

Now being asked to familiarise himself not only with managing Wi-Fi hotspots in the car and keeping the kids quiet with rear seat entertainment systems, but also with adaptive cruise controls, lane-assist systems, collision-avoidance systems, Over The Air (OTA) upgrades, etc, etc, etc. And there is no sign of the feature-adding programme slowing. If anything, today, the rate continues to increase.

All the time, the car driver is expected to simply cope with all of this new technology and to be impressed by him or her cars capabilities. In our opinion, though, there is a massive gap between the rate at which manufacturers are implementing new car technologies, and the rate at which car users want, need and – crucially – can understand and handle all of this new tech.

If J D Power has reported high-levels of consumer dissatisfaction based around the relatively simple process of managing Bluetooth in the car, what on earth does the future look like?

While some of the technology that is being enabled in cars operates below the surface, the driver is expected to have at least occasional and in some cases constant interaction with the systems hidden behind the dashboard and inside the car’s bodywork. We all know that that interaction is handled by the concept that is called the Human Machine Interface (HMI). The mechanical AM/FM radio station pushbuttons were an HMI, but today the HMI embraces not only the familiar and reassuring buttons and switches, but now adds touchscreens, gesture control, voice control, steering-wheel controls, head-up displays, audio alerts and more.

We’re lucky to try a variety of current spec cars, and to sample the different interpretations of an HMI that the OEMs are providing in their cars. While some work better than others, nobody has it right yet. If they had, then today’s connected systems would be simple, logical, non-distracting and easy and pleasing to use. They would make us want to engage with car technology. However, almost universally, the opposite is true. Car tech today is complicated, confusing and difficult to use.

The car companies have clearly not worked out what level of HMI – voice/touchscreen/gesture/conventional knobs and buttons – work best, so they are giving the customer them all, on what feels like an “if we give you enough options, you will figure out what works best for you” basis.

Speak to car company execs off the record and they will quietly acknowledge that the current HMI isn’t working. There also seems to be an awareness that sooner or later something will go badly wrong, and that the industry will be forced to confront the problem.

In the meantime, though, the buyer of today’s new cars is likely to end up sitting on his or her front drive scratching their head at how to make new features work (and probably deciding just not to bother) or, and this is the frightening bit, will end up having a nasty accident because they were distracted while trying to figure it out while driving.

We weren’t going to be able to get the industry to share their off-the-record thoughts about HMI development in this magazine, but we have spoken to a number of the leading players to get their views on both the state of HMI today and how things may change over the coming years. To spice things up, we didn’t just talk to the established players – the car companies and Tier 1 suppliers, we also asked the views of one of the people likely to steer and architect HMI development in the future – a young person with a masters degree in graphic and interactive communication, from the Faculty of Natural Sciences and Engineering, University of Ljubljana (Slovenia).

We asked all of these participants to not only give us their views on the current HMI, but also asked whether they thought that the automotive industry had lessons to learn from the consumer electronics industry. Read on for some interesting and illuminating views.
CC: Do you consider current HMI standards safe, logical and intuitive?

RR: I think they are safe. Logical? Probably. Intuitive? Very little. I think that the OEMs take a lot of the responsibility for the design themselves.

There are only a very few things that the driver does on a regular basis, and really you should be able to do those tasks with one click. However, today that is not the case because it is not the way that the OEMs have designed the HMI. They have concentrated on providing a structured, stepped approach and this does not lend itself to being intuitive.

Agreed practice – and even legislation – says that nothing should distract the driver.

CC: Which level of HMI do you see as most important – voice, touchscreen or other controllers?

RR: HARMAN believes that the HMI that presents the driver relevant information, when and where it is needed, is the best solution and more often than not, each will complement the other. Focus on what really matters for the user: simplify interactions, maximize attention, embrace the familiar and maintain consistency. It all comes down to what exactly is the user need that you’re trying to solve by introducing a new interaction pattern.

Conversational Interfaces too. Traditional in-car interfaces manifest as buttons, menus and other interaction patterns. With Conversational UI the structure is the same. But instead of buttons, menus, and stars, you tell the machine what you want using words. Automated, conversational experiences using NLU (natural language understanding) and ASR (Automated Speech Recognition) allow brands to communicate with and serve their customers right where they are, in a much more scalable way. The interactions of the future are not made of buttons.

Multi-modal interaction: As an example, an in-car touch controller that can change shape to communicate with the driver intuitively reduces information overload and lowers driver distraction by complementing vision and hearing based HMI channels.

CC: Do you believe that car companies and Tier 1 suppliers can learn lessons from consumer electronics companies?

RR: Yes. Currently OEMs follow one of two forms of HMI development.

The first is the traditional HW and SW solution, where the OEM starts from scratch every few years with each model. Each time they have to retest functionality like Tuner and Media Player.

Then there is owning their own proprietary HMI platform and framework. This method requires significant investment along with high cost of ownership. The OEM has to build and manage the framework too.
With both models it is costly to sustain continuous innovation compared to those used in the Consumer Electronics market. So, the automotive industry needs a new way to own and continuously enhance HMI, by leveraging a pre-established platform that allows it to build the HMI once. Analytics allow us to be able to identify interaction design patterns and create libraries and guidelines to focus on what really matters for the user: simplifies interactions, maximizes attention, embraces the familiar and maintains consistency.

CC: Is it likely that tech companies like Apple, Samsung, Google will become more involved in HMI development?

RR: This is happening more and more. We still believe in-car expertise is critical but the car industry can draw expertise from other sectors. This is something HARMAN has done for many years. While building these connected devices the biggest challenge is to understand how people will interact with these objects—voice, gesture, location or display—and design the right interaction model around that behaviour. A similar situation exists in the consumer world where Android devices from many manufacturers exist in parallel but look and feel completely different from each other due to the variation in the HMI. This is the key opportunity for OEMs as well.

CC: Do you think that it is likely that regulators will step in at some point in an effort to maintain safe driving?

RR: Yes, regulators are already looking at driver distraction as an issue so this is likely to be an area where there is more regulation expected. It’s another reason why HARMAN is looking at technologies that are more intuitive to use. Regulations will always lag behind technology. But we are already seeing a strong focus and concerted effort to manage the expectations and regulate the impact of new technologies.

CC: What will be the primary HMI for autonomous cars?

RR: There is undoubtedly a need to bring out the next generation human-machine interface (HMI) with the advent of autonomous driving. Automakers need to develop completely new interactive designs that build trust in the vehicle’s capabilities. Today, autonomous driving technology is not ready to handle all driving conditions and needs the driver to take control under various circumstances. Hence, HMI and User Interface are crucial to ensure driver’s contextual awareness. The driver will need to be informed and engaged enough to quickly take control back as and when it is needed.

From a safety point of view, the most critical part of autonomous driving is the handover to – and particularly from – autonomy. The infotainment system has the potential to play an important role in re-establishing the driver's contextual awareness as they prepare to take control. At CES 2017 we showed our Autonomous Drive Readiness Check solution in the Rinspeed Oasis concept car. This technology combines haptic feedback, eye gaze tracking and the monitoring the driver’s cognitive load readiness through pupil monitoring. These technologies work together to ensure that the driver is truly engaged and able to safely take control of the steering wheel.

The Rinspeed Oasis allowed us to demonstrate our suite of technologies that illustrate how advanced, holistic vehicle intelligence will transform the driving experience in autonomous vehicles, resulting in an intelligent, adaptable and personalized experience. Productivity is improved with the complete Microsoft Office suite and voice-controlled virtual assistant. Full-windshield head-up display (HUD) technology also demonstrated the future of the user interface and indicated how users might interact with their vehicles, whether that's to show high-resolution 3D maps, navigation prompts or entertainment to the passengers.

In order to realise the dream of building completely autonomous cars by 2025, OEMs should, then, select or build an HMI development tool with these key characteristics:

- Permits cross-platform HMI development easily: Linux, Windows, QNX and etc.
- Allows multiple HMIs to be developed based on the same state and/or business logic hence maximizing re-use
- Has a single code base that allows a very different HMI look and feel while sharing the same Middleware
- Has the ability to create amazing and intuitive experiences for all users
- Allows delivery of all applications as separate packages (libraries)
- Provides the capability to easily port to new Middleware platforms
- Has an unlimited number of synchronized displays and resolutions
- Uses all standard IPC and Network channels for interaction
- Allows for the architecture to be optimized for IVI solutions (booting, runtime performance)
- Provides the ability to modify Low Level Architecture (process decompositions, business logic, state management, etc.) without High Level Architecture change

Those are my views.
INTERVIEW WITH: DAVID HOLOCEK, DIRECTOR, CONNECTED PRODUCTS AND SERVICES, VOLVO CARS

We spoke to Volvo’s David Holecek, the main purpose being to bring David in on this issue’s headline feature discussing development of the Human Machine Interface (HMI). We also took the opportunity of a quick review of review what’s happened to OnCall and Sensus since we reviewed the Volvo XC90 last year. During the time that we have been putting together this issue, we spent some time with Volvo’s latest large saloon, the S90. While winter weather prevented us from creating a full-blown video review, we were able to huddle inside the car and create an overview of the latest iteration of Volvo’s Sensus infotainment system. You can watch that video by clicking on the link below.

CC: David, let’s start off by you bringing us up to speed with developments to Sensus.

DH: Sensus is the heart of the user experience in the Volvo car. Since you experienced Sensus in the XC90, a lot of work has been done – the regular ‘polishing’ that you would expect to happen, but then also adding new features and new apps. We have, though, deliberately avoided adding too many new apps, preferring to focus on some specific or niche functions, as we want to avoid creating too much complication for the user. A good example of one app that we have launched - which is actually very simple but which has been very successful - is ‘Record & Send’. We have spent time tracking people in everyday life. They may have come from a meeting, or have taken a phone call, and need to take notes to provide themselves with reminders or to make sure that they don’t forget a great idea. Picking up a pen and paper to do this is something you absolutely should not do while you are driving! Record & Send instead just provides you with a big ‘Record’ button. You record a message and an audio file is sent to yourself or your pre-populated email list. It’s very simple, but very effective and people really seem to like getting audio reminders.

Very simple apps like this are a good way to go. A couple of years ago everyone wanted to get Facebook working in the car, and that’s just so wrong. We have seen trends where some of our competitors have been trying to turn the car into a smartphone on wheels, which automatically brings you to replicating the smartphone experience in the car. This is wrong because you are not in the same sort of context, you are not trying to do the same sort of things and certainly not in the same way you would do them on a phone. The car companies need to think what is really relevant for the customer, and not add things just because you can. The things you do add should be as unobtrusive and easy to use as possible.

So, between the time that has passed since you reviewed Sensus in the XC90 (Ed. – October 2015) and now, you will see that we have added more apps, including Spotify – a highly requested feature. Of course, Spotify is also available to the car driver through Apple CarPlay and Android Auto, which are both also important additions since you last tried Sensus, but the fully integrated version that Volvo co-developed with Spotify now makes better use of the screen real-estate to both make it easier to use and also to allow us to add functionality.

CC: Right, and now to the real meat of this interview - do you consider that current HMI standards are safe, logical and intuitive?

DH: Speaking for our own systems, we have said very clearly that driver distraction, data integrity and data security are all part of our core safety values at Volvo. Safety is, of course, very important to Volvo. Where the HMI is concerned, while there may be certain degrees of standardised practices for HMI in smartphones, the same does not apply across car companies and the Tier 1 suppliers. In addition to this, things do not happen in the same way in cars - so there will be a learning curve, just as there always would have been some years ago if you were jumping between a Volvo, a BMW and an Audi. Now, though, we are not just learning how to switch radio channels or play a CD and it is different. The customer has to understand more about the philosophy behind a user interface, one that operates on a larger scale, and he or she has to understand how its ecosystem works. It’s not enough to understand an HMI based on app-based smartphone thinking, either, because that HMI may well have changed somewhat once it is in the car.

Volvo’s policy has been to support fully integrated apps, and when we are speaking to our app partners we make it very clear that the steps required to use the app should be clear and familiar when you step from using the app on the phone to using the same app in the car. The app user interface, though, should end-up totally integrated with the Volvo HMI.

We do find it easier today to integrate environments such as CarPlay and Android Auto than we did with the older-style replicating technologies such as MirrorLink. That was trickier for the car companies as you had less control.
CC: Which level of HMI do you see as most important — voice, touchscreen or other controllers?

DH: We are completely comfortable with the decision we made to integrate our touchscreen and for it to be in portrait mode. However, I wouldn’t necessarily describe it as the primary interface because it depends on what you want to accomplish, and also who is using the system. Some people are very comfortable with using voice, some are not. Some are happy to use a touchscreen display when driving, some are not and prefer to only use the controls on the steering wheel. It is down to personal preference, and from our side we do not want to push people to use one over another.

Beyond that, it is also about how these things work together, and part of that is contextual. Answering a call, changing volume levels — those are things you would expect to do on the steering wheel. So while the touchscreen may seem like it is the centre of the system, we don’t see that it is necessarily the primary device for your input/output while you are driving.

CC: Don’t you think, though, that the HMI, and the various combinations of control systems are still very complex for the average driver? It is hard to imagine Mr Average either being prepared or even bothered to learn all of the complex combinations of HMI input required to access most of today’s car systems.

DH: You are pointing to a very relevant question. We do see that there is a very different requirement today when it comes to delivery of the car to the customer, running through the car’s functions and the role of the HMI. AM/FM radios and CD players were much more straightforward! We need to educate the customer on the basics of the system in order to make it easy to understand the different functions. That is a fundamental shift in the way the delivery process needs to be run. This is something that we are addressing with our dealerships, but we are also allowing customers to experience certain aspects of the HMI before buying the car. We have an app, for example, which mimics certain aspects of the user interface and gives you a brief explanation of the basics. These are the types of things we need to do to help people become familiar with the core workings of our car systems.

CC: Do you believe that car companies and Tier 1 suppliers can learn lessons from consumer electronics companies?

DH: Absolutely. There is a whole lot that we can learn, both in the sense of how you develop things and how you present them. Without doubt, the consumer electronics (CE) industry is a few years ahead of us car companies. They also have the advantage of being able to update both hardware and software much quicker than we can. Importantly, the car companies are a bit more reluctant to bring in the ad hoc changes that a CE company might. It is quite possible that the car owner might not be so willing for the car to change overnight in the way a smartphone or tablet can as a result of getting an iOS or Android update. Being confused by something with your smartphone is not the same as being confused by something when you are in your car. The car companies need to be much more cautious when it comes to rolling out changes to the HMI itself. We need to watch the good things that are coming out of the CE industry and see how that can be put into context and how it can benefit the roll-out of technology in cars.

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Robert Bosch is one of the high-profile Tier 1 automotive technology developers, and has developed many of the systems in use today by the major OEMs. Connected Car met and talked with Bosch at the 2016 CES where the company was showing haptic touch screens – you can see that movie by clicking on the screen here.

Inevitably, Bosch is deeply involved with developments in the automotive human machine interface (HMI). We invited Bosch to be part of this issue’s headline feature, and talked with Iain Jacobs. Once again, to retain consistency, we discussed the same topics used in all of our interviews.

CC: Do you consider that current HMI standards are safe, logical and intuitive?
IJ: Considering that the majority of vehicles currently offer a fairly low level of automation, with responsibility still very much on the driver, it is important for the HMI to be intuitive and safe to use. Guidelines issued by the EU provide a comprehensive source of advice to help ensure that the size and simplicity of the HMI mitigate driver distraction as far as possible.
Considering that nearly 40% of newly-registered vehicles feature some form of HMI and that the automotive HMI market will grow at an expected rate of 7.7% over the next four years, standards will need to place strong emphasis on providing the most important information in a way that is not distracting or overbearing for the driver. Universal standards would enable drivers to use different vehicles without having to preoccupy themselves with an unfamiliar user experience.

CC: Which level of HMI do you see as most important – voice, touchscreen or other controllers?
IJ: It is important that HMI does not become a distraction to the driver. The number of UK road-traffic incidents due to driver distraction has increased by more than 30% in recent years, so, while there is an increasing demand from consumers to be able to use smartphone-related technology on the move, the driver cannot spend time navigating through a touchscreen, as they are still very much responsible for the safety of the vehicle, themselves and other road-users.

Bosch aims to reduce the level of driver distraction through a mixture of technology which also allows for personalisation: voice recognition, Head up Displays and advanced gesture control which further reduces the need for drivers to look at the HMI while driving, and the haptic screen which allows users to feel their way around a touchscreen.

CC: Do you believe that car companies and Tier 1 suppliers can learn lessons from consumer electronics companies?
IJ: Consumer electronics have benefits and disadvantages: the popularity of smartphones lies in their simplicity and the level of personalisation that they offer – both of which are aspects of infotainment that the automotive industry is yet to fully exploit.
Current trends are becoming increasingly oriented towards smartphone integration – particularly with systems such as Bosch mySPIN, which works with both Android and iOS – but there is much more to come from this avenue of in-car entertainment and Connected Services in terms of the level of functionality that they offer.
However, a vast segment of the consumer electronics sector still relies heavily on interaction with a screen, which, of course, is neither safe nor practical while driving a vehicle. This is where developers of HMIs in the automotive sector can truly start to innovate and offer similar levels of functionality while maintaining a safe and practical environment for the driver.

CC: Is it likely that tech companies like Apple, Samsung, Google will become more involved in HMI development?

IJ: Considering consumers’ shifting preference towards technology-oriented vehicles, and the fact that the value of the global in-car entertainment hardware market is set to reach $36 billion by 2021, it is inevitable that manufacturers will aim to fully exploit the benefits of consumer technology enjoyed by smartphone and tablet users and work towards achieving full integration with the vehicle’s HMI. Alongside home and work, connectivity is turning the car into the third living space. With the help of personalised communication between the car and the driver, increasingly high performance and comprehensive services will be safe to operate in the future as well.

In the future, the HMI will play an increasingly important role in the car – especially when it comes to automated driving. For instance, it lets the driver know whether automated driving is possible on a specific route. To hand over responsibility for driving to the car, the driver must then press two buttons on the steering wheel for several seconds. During the automated drive, the HMI shows the driver what the car’s environmental sensors detect and how much time is left until the driver needs to start driving again.

The rate of development in the consumer electronics sector has typically been greater than in automotive. This is where companies like Bosch that work in both the automotive and consumer electronics sectors seize opportunities. Bosch can harness the disruptive nature of the consumer electronics sector and integrate it into the automotive sector, where customers have very specific needs and requirements.

CC: Do you think that it is likely that regulators will step in at some point in an effort to maintain safe driving?

IJ: To a certain extent, international institutions have already made a concerted effort to shape the direction that manufacturers take regarding the design and functionality offered by the vehicle HMI – the EU’s Statement of Principles for Human-Machine Interaction and e-Safety, for example. However, these often leave judgement regarding the safety of a given HMI to the discretion of industry experts, which creates an element of subjectivity, especially as technology progresses through the partially automated stage of functionality. It is here that standardisation would be beneficial, ensuring that distraction is kept to a minimum, when using the vehicle’s base HMI and any third-party apps.

CC: What will be the primary HMI for autonomous cars?

IJ: The primary HMI will very much depend upon the stage of automation that we are at. Currently, with a number of vehicles offering partial automation, HMIs must provide consumers with increased levels of connectivity, while maintaining ease of use, minimising risk to the driver and other road users.

When vehicles become able to take control from the driver for a prolonged period of time, focus will shift to providing a fluid transfer of control from vehicle to driver. However, as highly autonomous and fully autonomous vehicles become commonplace, manufacturers will be able to focus on fully exploiting the potential of a screen-oriented experience, and thus consumer technology.
VH: Do you consider that current HMI standards are safe, logical and intuitive?

JW: When new technologies are introduced by the automotive industry – take cruise control as an example – the players have a good track record. Early design implementations may have a few different design models, but then the industry comes together to standardise on a set process or interface – Set/Resume/On/Off in the case of the cruise control. A proven and tested HMI evolves that is easy for consumers to use. But that takes time, and we are in a state now where many new technologies have come into the car, and the manufacturers are trying to work out what is the right model.

At Intel, what we are doing is some research into what we call Trust Interactions. We’re looking at some of the top use cases for highly- or fully-automated vehicles, like ordering a robo-taxi, getting into the car, providing and then changing a destination then getting out of the car. Then we are trying to work out what interactions in those use-cases would engender ‘trust’ – what would make the consumer feel comfortable, in the case of a parent, confident that the vehicle that just took their child away would deliver them safely to their destination, and that the child has a way of interacting with the vehicle that is safe, logical and intuitive. We’re devising some test models, testing them on real users and then publishing the results back out to the industry to help all of us understand what are the right interaction models. I don’t know whether we are there yet, in terms of a universal standard, but I think that the work that we are doing, and the similar work that is being done across the industry will eventually converge and create the same sort of commonality as in the cruise control example I mentioned earlier.

VH: Do you think, then, that in the hugely broad and diverse automotive industry, an universal standard for HMI is an achievable goal?

JW: I do think that a standardised interaction model is achievable, if we separate design from interaction models. Going back to the cruise control example, by design the controls could be on the steering wheel, the console or the touchscreen, but the interaction model would be the same. Using that thinking there could be a consistent interaction model for basic functions no matter whose autonomous vehicle you were using. That is something that the industry could see the sense in converging on. You just have to decide what are the correct sets of interaction.

VH: Which level of HMI do you see as most important – voice, touchscreen or other controllers?

JW: We think it is going to be a combination. Our research has shown that multi-modal communication is going to be critical. There are going to be cases and reasons why in some cases you will use voice, in some cases touchscreen, and in other cases conventional controls – buttons and switches, depending on the context and the passengers.

VH: Isn’t that just a convenient cop-out, though? Isn’t the industry saying “If we throw every interface at it, hopefully something will be right?”

For this feature, we spoke to Intel. As Connected Car editor Vince Holton notes towards the end of this interview, Intel has been playing in the connected car sandpit for many, many years. It is not the only semiconductor manufacturer to be making a major play today. Qualcomm is just one of a number that see the automotive market as very important indeed. But Intel occupies a deeply entrenched position in not just communication technologies, but in core processing. Vince Holton sat in the chair for Connected Car, and asked what, then, are Intel’s thoughts on the HMI?
VH: Well, you have a good point, but this is really where the magic needs to happen. For example, if you have all of these control interfaces in the car, how does the car’s brain know that it should be listening for voice instructions? How should it know that the touchscreen is the main interface at this moment? Rather than offering all three being a cop-out, I think it is actually going to be a big challenge to get them all to work correctly and in concert with each other.

VH: Indeed, but I see it differently. There seems to be an inexorable rise in cross-industry support for digital personal assistants and - let’s acknowledge it, Alexa seems to be leading the charge – which would promote voice control above other control interfaces. This is as true in the car as it is in the smart home or anywhere else for that matter.

JW: I think you could be right. I think that with advances in machine learning, and particularly natural language processing has offered us an opportunity to cross that chasm from simple voice control to natural language and contextual understanding. The greater processing capability of vehicles to come will allow you to have an Alexa-like use case within the car. With many of the digital personal assistants, your voice command goes up to the Cloud and comes back down. We’re going to have data-centre class performance in the vehicle, enabling natural language processing. So, yes, you are onto something, and for the average consumer, using natural language to talk to the car is going to be the most comfortable and easiest way to adopt some of this new automotive technology. You won’t have to learn a new interface, a new app design – you can just talk.

VH: Do you believe that car companies and Tier 1 suppliers can learn lessons from consumer electronics companies?

JW: I think we can learn a lot from each other. The car industry has a century of experience that is very different from consumer electronics. So what’s exciting about these new vehicles is that we are seeing a mash-up of a long history of automotive development with electronic/IT design from the consumer electronics companies. For this to work, we need to learn from each other. You cannot just project a consumer electronics design ethos onto a vehicle, nor can you do the reverse and expect it to work. We have to work out elegant ways to combine what makes a car feel like a car and a CE device feel like a CE device. They have to be integrated seamlessly so that it feels like a unified design experience and not two separate worlds bolted together.

VH: OK, but tech companies like Apple, Samsung, Google are aggressively pushing their way into the car. Is it likely that they will become more involved in HMI development? And is this something that the automotive industry wants?

JW: Both Apple and Google, with CarPlay and Android Auto, have examples today of how they are already involved in HMI development, using projection to enable a phone-like experience in the car. But I think the challenge is that if you are doing HMI development in a vacuum – just concentrating on what is on the screen – then you are not considering the larger interaction model on a vehicle level. This includes how you get in and out of the vehicle, the physical positioning of people inside the vehicle, especially if the vehicle is driving itself. I think that is where some of that smartphone-based interaction will fail to deliver that intuitive, natural design integration and feel that we really like. That’s one of the challenges of this mash-up. We have to help those leading smartphone technology companies into a broader field of thinking for vehicle-wide HMI development activity, not just the single screen.

VH: I know from my own experience of driving today’s car that using current HMI implementations is at least distracting and sometimes dangerous. And I think the industry is quietly aware of this. Do you think that it is likely that regulators will step in at some point in an effort to maintain safe driving?

JW: I think it is certainly possible. There is a lot of history of regulators mandating safety solutions – most recently the back-up/rear-view camera in all vehicles, then there are airbags etc. At the end of the day a driver assistance system that supports automatic, emergency braking or some other self-driving capability is an active safety system – certainly a much more advanced one – and the benefits to society of keeping people safe are so strong that it is highly likely that some active safety functions will be mandated by regulators.

VH: OK, then let’s step forward in time to when we are sitting in our autonomous vehicles - what will be the primary HMI for autonomous cars?

JW: Well, as the steering wheel and pedals disappear, you will start thinking about your vehicle as a third state, like your home or your work. You may choose to do more home-like functions such as watch some TV, read a book, or you may choose to do some work. It will be interesting to see how the interaction model evolves with this sort of new experience in the car.

VH: What about the cloud interface? How does the car’s brain know that it should be listening for voice instructions? How does it know that the touchscreen is the main interface at this moment? Rather than offering all three being a cop-out, I think it is actually going to be a big challenge to get them all to work correctly and in concert with each other.

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VH: Entertainment experiences will drive needs for high-quality displays and audio, while work experiences will drive other things – you may even have a little desk in your car. I think there won’t necessarily be one primary HMI, it will be changeable, based around context and activity – am I looking to relax, or am I looking to be productive?

VH: OK, then let’s step forward in time to when we are sitting in our autonomous vehicles - what will be the primary HMI for autonomous cars?
CC: Do you consider that current HMI standards are safe, logical and intuitive?

GS: Every infotainment system aims to be as intuitive logical and safe as possible. There is a high precedent set by consumer electronics and customers do not have the time or effort to continually learn new HMI. However, we must remember that for the driver the primary task is to drive and not control a user interface. With this in mind we work within the VW group to understand market specific requirements. We follow where possible the market guidelines such as Driver distraction guidelines for the USA defined by the NHTSA or the EU statement of principles for Human machine interaction and e-safety.

The ultimate aim is to reduce the eye time off the road when performing any interaction. A configurable Head up display and well-positioned TFT displays play a significant role in this by keeping key information in the eye line of the driver.

CC: Which level of HMI do you see as most important – voice, touchscreen or other controllers?

GS: I believe they all have an important role to play in the user experience. Owners are familiar with touchscreen interfaces from consumer electronics and with a logical UI the learning curve is reduced. Haptic controllers lend themselves to more precision control in high list content screens. A well-positioned haptic rotary controller is a perfect complementary control to a touchscreen reducing the eyes off road time in specific situations.

Voice control becomes much more important when guidelines dictate that UI elements should be disabled when the vehicle is moving. Voice control becomes the only option to complete a task when 100% eyes on the road situation is needed. Typically the in-vehicle voice systems are mechanical in that a set of defined steps or words must be completed in a specific order with little deviation. Users are now used to natural language systems from Apple, Google and Amazon which are internet based. The connected car is enabling the higher data rates required for live recognition engines. As these recognition engines become more integrated into the vehicle environment then voice will play a more important role in the user experience. At Bentley we are working towards implementing such system to enhance the user experience.

CC: Do you believe that car companies and Tier 1 suppliers can learn lessons from consumer electronics companies?

GS: Yes. The high pace of the consumer electronics market is forcing a change for vehicle manufacturers who in the past could not keep up and were always on the back foot. The gap between automotive and consumer electronics is reducing as Tier 1 and vehicle manufacturers introduce scalable systems that can be updated over the air and integrate the latest consumer tech into the car. Customers are more tech savvy and have higher technology expectations than ever before.
One area that consumer tech excels is integrating market specific trends and requirements. Expectations from users differ in region and consumer technology already caters for this. At Bentley we focus on the needs of the user in these different market areas. Specific examples in China are address entry. We focus on UI for the sequence of entry, the method of entry whether keyboard or handwriting recognition. Using market data we focus on the high expectations of the Bentley user in that market but we can certainly learn from consumer devices.

**CC:** Is it likely that tech companies like Apple, Samsung, Google will become more involved in HMI development?

**GS:** The introduction of Apple CarPlay and Android Auto has by default had this effect. When using these systems the user interface is Apple or Google and as vehicle manufacturers we must comply with the specified requirements.

At Bentley our brand is very important, for Bentley the user interface is treated very much like an A surface. The colour palette used in the UI is tuned to the hard parts and switches in the vehicle. The UI is high integrated and designed with input from the styling department and signed off by them at every milestone. For Bentley this is very important. When using a third party HMI the integration becomes much more of a challenge as we cannot control the logic, style or the theme of the UI therefore it is not our preferred option.

**CC:** What will be the primary HMI for autonomous cars?

**GS:** This is difficult question. At the point the vehicle becomes fully autonomous the driver becomes a passenger. The key question is what do you need to do in the car that cannot be done on a smart phone or smart device? How can the vehicle add value to your journey? Augmented head up displays could become more prevalent providing a more interactive travel experience for both driver and passenger. A key challenge for the user interface will be in the transition from autonomous to driver control and vice versa. The interaction with the system and type of content displayed will be very different in the autonomous and non-autonomous situation. A seamless transition that is intuitive and logical is important specifically when adhering to any regulations in the specific market.

### HERE AND PIONEER PARTNER ON GLOBAL MAP SOLUTION AND LBS

HERE and Pioneer/IPC have announced their intention to enter into a strategic partnership to enable global mapping solutions and next generation location-based services for the automotive and other industries. The agreement follows the companies’ recent cooperation exploring the application of Pioneer’s 3D-LiDAR sensor technology in the development of a data ecosystem for autonomous driving.

By linking their mapping and automotive technologies and assets, HERE and Pioneer plan to enable fully integrated global SD (standard definition) and HD (high definition) mapping solutions at what the two companies claim will be a scale and quality-level unmatched in the industry. These solutions are intended to support new innovations for customers in in-vehicle infotainment and autonomous driving as well as in any industry where location intelligence can be applied. HERE and Pioneer are also exploring the development of new services that harness the real-time data of connected Pioneer devices.

“We are very pleased that, through a strategic alliance with HERE, Pioneer/IPC can provide a global map solution and location services,” said Susumu Kotani, President and CEO of Pioneer. “We strongly believe that HERE and Pioneer can create new value through the establishment of a data ecosystem for the forthcoming era of autonomous driving by integrating the strong expertise and technologies both companies have. Also, the data ecosystem and the production of HD maps will contribute to the development of a new market globally by way of greater coordination and cooperation with related organizations in Japan.”

### VOLKSWAGEN ENCOURAGES CUSTOMER INTERACTION WITH NEW APP

‘My Volkswagen’ is a new app for connected journeys, giving current and would-be Volkswagen owners the chance to store and access all of their significant interactions with the brand in one digital dashboard.

Accessed via the owners’ section of the Volkswagen UK website as well as via an application for either iOS or Android, My Volkswagen acts as a personal companion and guide that help customers get the most out of the brand whether they are looking to buy a new car, or already own one.

Customers signing up to the forever free My Volkswagen service apparently benefit from a number of features which help to make owning a car simple and easy:

- View all of their cars; have sight of their owned, ordered and configured cars in one place
- Save car configurations and personalised digital brochures
- Track an ordered car; track the progress of a new car order; with alerts & push notifications for status changes
- View service history
- Make a service booking
- Track a service; follow their car’s service through the workshop, get Express Visual Check results (including video) and approve or defer ‘red’ and ‘amber’ categorised work*
- Access information and support: view their car’s owner’s manual anytime anywhere; explore accessories; view ‘how to’ guides; learn about warning lights and access FAQs all in one place

Volkswagen claims that the new app is among the most comprehensive platforms of its kind, particularly within the automotive sector.
Volkswagen and Mobileye are planning to implement a new navigation standard for autonomous driving starting in 2018. Future Volkswagen models will use the camera-based map and localisation technology Road Experience Management (REM) from Mobileye. Volkswagen and Mobileye will both be collecting data and utilising this for a new generation of highly intelligent maps.

The Israel-based company Mobileye is a manufacturer of technologies for accident prevention and autonomous driving. REM is one of the latest Mobileye systems, using crowd-sourcing (data from many cars – the swarm) to generate real-time data for precise localisation and acquisition of high-definition track data. Mobileye believes that this makes REM an elementary information level for autonomous driving. Here is how REM works in practice: the Volkswagen cars, which are equipped with front cameras, acquire lane markings and road information via optical sensor systems from Mobileye, and this information flows in compressed format into a cloud. This fleet data is used for continuous improvement of high-definition navigation maps with highly precise localisation capability. These, in turn, serve as a foundation for autonomous driving and advanced development of many assistance systems.

“The future of autonomous driving depends on the ability to create and maintain precise high-definition maps and scale them cost-effectively. A much more important aspect is that the agreement provides a framework for industry-wide cooperation between automobile manufacturers to jointly produce the maps needed for autonomous driving.”

The agreement is said to be the first of its kind to merge the data of different automobile manufacturers worldwide to create a single ‘high-definition world map’ and is intended to form an industry-wide standard (though the VW/Mobileye release made no mention of which other manufacturers may be involved).

**U-BLOX POSITIONING AND WIRELESS TECHNOLOGIES DRIVE BAORUH ELECTRONIC SMART BUS SOLUTION**

U-blox, which builds wireless and positioning modules and chips, has announced that its technology is powering a new smart bus solution from Baoruh Electronic in Taiwan which combines LTE-based telematics and Automated Fare Collection (AFC) for intelligent fleet management.

The new POS One smart bus solution uses the NEO-M8U positioning module from u-blox for enhanced positioning accuracy thanks to acceleration and gyroscope sensors incorporated in this module. A TOBY-L280 cellular module transmits vehicle telematics and onboard payment transactions over a high speed LTE connection to back systems, while an ELLA-W131 module provides additional Wi-Fi and Bluetooth connectivity for ease of access to vehicle data logs and video recordings.

The NEO-M8U GNSS and Untethered Dead Reckoning (UDR) module used by Baoruh’s new solution enables accurate positioning even without a clear sky view, such as in urban canyons, underground parking or tunnels, by using integrated three dimensional inertial sensors to complement GNSS positioning data.

The TOBY-L280 LTE module used for communications with fleet management and payment systems provides 150 Mbps 4G speeds with 3G fallback. u-blox told Connected Car that the high speed connectivity not only gives fast and reliable payment processing but can be used for video streaming from interior or exterior vehicle cameras.

An ELLA-W131 multiradio module provides Wi-Fi as well as Bluetooth connectivity. Simultaneous client and access point operation is supported, allowing the module to act as a wireless hotspot and at the same time be connected as a client to another Wi-Fi access point.

**WAZE JOINS SMARTDEVICELINK CONSORTIUM**

Waze, the free, real-time crowdsourced traffic and navigation app powered by a community of 75 million monthly active drivers, has joined the SmartDeviceLink (SDL) Consortium comprised of Ford, Toyota, Mazda, Subaru, PSA and Suzuki.

With the integration of SDL, Waze says it will continue to put the driver community at the forefront, focusing on optimizing and evolving the driver experience. Waze has apparently joined the SDL Consortium in order to better serve drivers everywhere and create an intuitive navigation experience. With SDL, Waze guidance can be presented in the in-car driver screen and new features are made available as soon as they are released in the app.

First announced in January 2017 by Ford Motor Company and Toyota Motor Company, the SDL Consortium is a non-profit organization working to manage an open source software platform with the goal of giving consumers more choice in how they connect and control their smartphone apps on the road.

Doug VanDagens, chairman of the SmartDeviceLink Consortium told Connected Car, “Waze is a perfect example of how SDL makes it easy for developers to bring new and exciting apps to the dashboard. We are excited to have Waze as part of the SDLC and look forward to working with them to move this open standard forward.”
HARMAN INTEGRATES WIRELESS APPLE CARPLAY CONNECTIVITY

Harman has announced the commercial implementation of Apple CarPlay integration through a wireless connection, and claims this is a first for the connected car industry. Through Harman’s end-to-end infotainment system, a vehicle’s Bluetooth and Wi-Fi will enable the connectivity required to support CarPlay: creating what Harman describes as a greatly enhanced wireless experience for the user. The solution is currently being deployed in the market on Harman infotainment systems for a luxury German automaker.

While other implementations of Apple CarPlay have been supported through a USB connection to-date, Harman says it is the first to enable wireless implementation with the iPhone connecting via Bluetooth and data transferring via Wi-Fi. The Harman infotainment system provides flexibility between native and CarPlay Human Machine Interfaces (HMIs), and allows for simultaneous operation of head unit functionality and CarPlay navigation. The integration of Apple CarPlay provides users the various functions of their iPhone, including calls, music playback, mobile office, and navigation to be controlled through the car’s display. Additionally, the system also allows the use of voice-recognition for a safer, hands-free experience.

Phil Eyler, executive vice president and president, Connected Car, Harman commented, “Harman continues to deliver options to consumers for seamless integration of multiple mobile ecosystems into our integrated automotive platform. Whether CarPlay, Android Auto, or any other projection mode solution, Harman is the industry leader with pioneering support for these accessory apps. We look forward to working with automakers to roll out this technology and together with many Harman solutions to offer consumers safe, secure, and harmonious driving experiences.”

NISSAN DEMOS AUTONOMOUS DRIVING IN EUROPE

As part of its commitment to creating a zero-emission, zero-fatality future for mobility, Nissan has been showing its real-world testing of next generation autonomous drive prototype vehicles taking place in the east of London.

This is apparently the first time that Nissan has demonstrated its latest autonomous drive technology on public roads in Europe, though the company has already conducted public-road testing in Japan and the United States.

As part of the London demo, participants in the passenger and rear seats were given the opportunity to experience the technology, which consists of millimeter wave radar, laser scanners, cameras, high-speed computer chips, and a specialized HMI (Human Machine Interface). All of this helps allow the vehicle to operate in an autonomous manner on both highway and city/urban roads including runabouts once the destination points are entered into the navigation system.

The London test follows recent announcements that both the updated Qashqai and the new Nissan LEAF, both coming in the near future, will be equipped with ProPILOT autonomous drive technology to enable single lane autonomous driving on motorways. Meanwhile, last year in Japan, Nissan launched the Serena, its first model to be fitted with ProPILOT. In December ProPILOT autonomous drive in the new Nissan Serena won 2016-2017 Japan Car of the Year Innovation Award.

There are also plans for the technology to be introduced in the U.S. and China markets. A multi-lane autonomous driving technology will enable automatic lane changes on highways and is planned for introduction in 2018 while autonomous driving on urban roads and in intersections is planned for launch in 2020.

FORD INVESTS IN ARGO AI AS PART OF DRIVE FOR AUTONOMOUS VEHICLE LEADERSHIP

Ford is investing $1 billion during the next five years in Argo AI, an artificial intelligence company, to develop a virtual driver system for the automaker’s autonomous vehicle coming in 2021 – and for potential license to other companies.

Founded by former Google and Uber leaders, Argo AI is bringing together experienced roboticists and engineers working in autonomy from inside and outside of Ford. The team of experts in robotics and artificial intelligence is led by Argo AI founders Bryan Salesky, company CEO, and Peter Rander, company COO. Both are alumni of Carnegie Mellon National Robotics Engineering Center and former leaders on the self-driving car teams of Google and Uber, respectively.

“As Ford expands to be an auto and a mobility company, we believe that investing in Argo AI will create significant value for our shareholders by strengthening Ford’s leadership in bringing self-driving vehicles to market in the near term and by creating technology that could be licensed to others in the future” said Ford President and CEO Mark Fields.

The current team developing Ford’s virtual driver system – the machine-learning software that acts as the brain of autonomous vehicles – will be combined with the robotics talent and expertise of Argo AI. This partnership will work to deliver the virtual driver system for Ford’s SAE level 4 self-driving vehicles.

By the end of this year, Argo AI expects to have more than 200 team members, based in the company’s Pittsburgh headquarters and at major sites in South-Eastern Michigan and the Bay Area of California.
CONNECTED CAR VIDEO ARCHIVE

Click on the movie screens below to access the growing archive of movies previously created by the Connected Car team.

Connected Car Magazine review:
Audi Virtual Cockpit and Audi Connect

Connected Car Magazine overview:
Volvo On Call in the new XC90

Connected Car: Peter Virk, Jaguar Land Rover, interview part 1

Connected Car: Peter Virk, Jaguar Land Rover, interview part 2

Connected Car review: BMW i8

Connected Car talks Driver in the Loop simulators with Ansible Motion

Connected Car magazine overview of BMW Connected Drive

ATAM: the ultimate solution for automated interoperability testing from NextGen
CES 2016: Audi

CES 2016: Bosch

CES 2016: Ford – AppLink and SYNC 3

CES 2016: Ford – Autonomous vehicles

CES 2016: HERE – HD Live, mapping and location

CES 2016: Hyundai Mobis

CES 2016: Kia – autonomous driving demonstration

CES 2016: Qualcomm – Interview with Nakul Duggal
FORD ENABLES LIVE TV STREAMING, DIGITAL MUSIC CONNEXIONS, WI-FI HOT SPOTS

Ford claims to be reinventing the way drivers and passengers entertain themselves while on the road, offering new ways to wirelessly stream live TV and listen to music in its newest SUVs. The company says that these new features are a result of shifting trends toward streaming services, whether for television shows, movies, music, podcasts and more.

In the all-new Ford Expedition SUV, available this fall, an available Wi-Fi hotspot supports up to 10 devices at once – up to 50 feet from the vehicle – while an available dual-headrest rear seat entertainment system allows passengers to watch live TV via SlingPlayer on either of two video screens. The system apparently represents the first time SlingPlayer – which connects to a user’s home Slingbox account – is offered in an automobile. SlingPlayer is embedded into the entertainment system and lets passengers connect to a home-based Slingbox system to watch and control the TV signal.

When the Expedition reaches showrooms, passengers will also be able to use the available dual-headrest rear seat entertainment system monitors to watch movies and video – even TV shows and live sporting events – streamed from a home cable or satellite system.

The system, called EVO by developer VOXXHirschmann Corp., includes two 8-inch monitors integrated into the back of the front-seat headrests, a secure, in-vehicle wireless network hub that enables passengers to connect using a mobile device, and a host of sources by which to view content – including SlingPlayer.

This connectivity isn’t limited to time in the vehicle. The wireless signal – when using the available Wi-Fi hotspot in Expedition – has a range of about 50 feet.

VISTEON REIMAGINES AUTOMOTIVE INFOTAINMENT

Visteon launched its next-generation Phoenix infotainment platform at CES 2017 in Las Vegas, suggesting that Phoenix signals a technological breakthrough in infotainment, breaking down the barriers between a vehicle’s native apps and apps running on smartphones or other personal devices.

Visteon designed Phoenix to unlock innovation by enabling third-party developers to create apps easily, while delivering built-in cybersecurity and over-the-air updates. Phoenix offers an automotive-oriented JavaScript application program interface (API) for HTML5-based app development. Visteon claims it is the first automotive infotainment system to facilitate app creation through a software development kit (SDK) and software simulation of the target hardware system.

Visteon President and CEO Sachin Lawande told Connected Car, “Visteon is reimagining infotainment from the perspective of both app developers and the end-user. “Through this latest advancement, Phoenix will break down the traditional barrier for embedded automotive app development that has restricted the availability of apps for infotainment systems.”

Visteon offers a Phoenix SDK, incorporating libraries of code, documents and a simulator to support app development by third parties. The SDK makes app development easier than the conventional approach, says Visteon, as that requires custom software and hardware, lacks third-party tools and can be costly and time-consuming.

Lawande concluded: “With Phoenix, the developer will be able to log on to a Visteon microsite and create and test apps with an SDK and a simulator. The app is then validated by the automaker or Visteon and published to an app store.”

QUALCOMM AND TOMTOM CROWDSOURCE HIGH-DEF MAPPING DATA FOR AUTONOMOUS DRIVING

Qualcomm Technologies is working with TomTom to use the Qualcomm Drive Data Platform for high-definition (HD) map crowdsourcing, the goal being to accelerate the future of autonomous driving. Qualcomm Drive Data Platform collects and analyses data from different vehicle sensors, supporting smarter vehicles to determine their location, monitor and learn driving patterns, perceive their surroundings and share this perception with the rest of the world. TomTom’s HD Map, including RoadDNA, is a highly accurate, digital map-based product, which assists automated vehicles to precisely locate themselves on the road and help determine which way to manoeuvre, even when traveling at high speeds.

Traditional development of maps requires deploying dedicated fleets of vehicles that are equipped with professional-grade sensors to collect location, raw imagery, Lidar and other data, which is then transferred, stored and processed in data centres. Now that cars are increasingly connected and equipped with a range of sensors, new and complimentary approaches become possible.

Using the positioning, on-device machine learning, heterogeneous compute and connectivity capabilities of the Qualcomm Drive Data Platform, TomTom and Qualcomm Technologies aim to facilitate adding an improved, scalable and cost-efficient crowdsourcing approach to the mix of sources for HD map making. The new concept is designed to allow massive numbers of connected cars to see and understand their environment, traffic and road conditions, and support real-time input for map and road condition updates.
We browse web video presentations on the subject of connected car technology on an ongoing basis, and each issue will include a selection that we have reviewed.

Click the movie screens to watch the videos

- Ericsson – Buzz Film Connected Car
- Hyundai Motor – Cisco Connected Car Platform
- Microsoft Connected Vehicle Platform
- Bosch at CES 2017: The Connected Car as 3rd Living Space
- SEAT, SAMSUNG and SAP join forces to develop the “connected car” of the future
- IBM Watson IoT Automotive and the Connected Car
- SAP, Concur, Hertz and Nokia showcase connected car technology at MWC 2017
- Inspired by Glass: Corning’s Connected Car Prototype
### TOP HANDSET RELEASES BY REGION – Q1 2017

**EUROPE**

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**NORTH AMERICA**

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Connected cars feature at events all over the world, and not just at traditional car shows. Connected Car maintains a list of significant shows. If you are aware of events we have missed, please feel free to let us know.

2017

9-12 May 2017
Genivi 16th Member Meeting
Hilton Metropole Hotel, Birmingham, UK
www.genivi.org

5-8 June 2017
Bluetooth SIG UnPlugFest 57
Hong Kong, China
www.bluetooth.com/news-events/events

13-15 June 2017
Connected Cars Conference
London, U.K.
https://tmt.knect365.com/connected-cars/

5-6 July 2017
ConCar Expo
Berlin, Germany
http://www.concarexpo.com

1 September 2017
Bluetooth Asia 2017
Shenzhen, China
www.bluetooth.com/news-events/events

9-12 September 2017
Bluetooth SIG UnPlugFest 58
Barcelona, Spain
www.bluetooth.com/news-events/events
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In Connected Car magazine each quarter readers are able to access market-specific phone/smartphone data and detailed regional summaries from our sponsor NextGen Technology's global market research (see pages 28-29).