

# Connected Car

INFOTAINMENT / TELEMATICS / INTERNET OF EVERYTHING

Issue 5 / July 2016

Video Enabled



## AUDI - COMMITTED TO ADVANCING TECHNOLOGY

Connected Car meets with two of Audi's connectivity gurus



## NEXTGEN LAUNCHES ATAM

The new standard in automated interoperability testing



## INTERVIEW: GENIVI ALLIANCE

Matt Jones and Vince Holton discuss Genivi and open-source platforms



## MIRROR, MIRROR ON THE WALL...

Whose smartphone mirroring system is best of all?



## INTERVIEW: HARMAN

Examining Harman's 5+1 cyber security framework

NextGen

# FROM THE DRIVING SEAT

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### CONNECTED CAR IS PRODUCED BY:

Click I.T. Limited  
Hampshire Gate, Langley, Rake  
Hampshire GU33 7JR, England

### CONNECTED CAR IS DISTRIBUTED BY:

NextGen-Connect.com  
8600 W. Bryn Mawr Avenue, Suite 500N  
Chicago, USA  
IL 60631

Connected Car is distributed on a quarterly basis to companies and individuals with an interest in connected car, infotainment and telematics technology.

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Hello, and welcome to the latest issue of Connected Car magazine. This issue contains some very enlightening interviews and features, so get yourself a coffee, put the 'do not disturb' sign on the door, switch on the OOO system, sit back and enjoy.

The interview that I carried out with Audi (see pages 8-12) was very, very interesting. Dr Peter Steiner and Marcus Keith were both very open and willing to share their views on developments in the connected car space. This is always refreshing. We discussed Audi's experiences of working with Apple and Google, and I certainly came away from the interview with a good understanding of Audi's goals and the roads that the company is likely to go down. Companies like Audi tend to set the pattern, so this one is very worth reading.

Part of the discussion with Audi covered smartphone mirroring in the car. This is a bit of a minefield for the car companies, as they are forced to support several platforms simultaneously. We have taken a closer look at mirroring, the relative merits of CarPlay and Android Auto, and who is supporting what.

Which leads this intro nicely on, to open-source software. We have two interviews that focus on open-source. The first is with Matt Jones, director of future infotainment at Jaguar Land Rover, but in this case I was talking to him in his complimentary role as President of the Genivi Alliance. And then we have Toyota. That company recently announced it would adopt Ford's open-source SmartDeviceLink platform, and I spoke with Kenichi Murata, Group Manager, Connected Strategy & Planning, Connected Company, Toyota.

NextGen helps the automotive companies ensure that mobile devices work seamlessly in their vehicles – the company's world revolves around interoperability. In this issue we look at ATAM, a new offering from NextGen that automates the interoperability process, allowing engineers to focus on development rather than repetitive manual testing.

And finally (if matters relating to security can ever be regarded as a 'final' consideration!), we follow on from our previous investigation into cyber-hacking and threats to the connected car. I talked with Harman's Hans Roth about the company's 5+1 Cyber Security Framework.



Vince Holton  
Editor  
**Connected Car**

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# NEXTGEN ATAM – THE ESSENTIAL AUTOMATION SOLUTION FOR DEVELOPERS OF CONNECTED SMART DEVICES

As the Internet of Things expands and grows, consumers use an ever broadening range of devices; mobile phones, computers, tablets, laptops and wearables, all connected to data and cloud services for intelligent systems, information, entertainment and more.

**T**HE INTERNET OF THINGS IS ENABLING NEW SERVICES BASED ON A MYRIAD OF CONNECTED DEVICES, SENSORS AND CONTROLS. IT'S ENABLING PERSON TO PERSON, PERSON TO VEHICLE, PERSON TO CLOUD AND VEHICLE TO CLOUD COMMUNICATION, OFFERING CONSUMERS ENTERTAINMENT SERVICES, INFORMATION AND COMMUNICATION SYSTEMS, COMMERCE AND PAYMENT TRANSACTIONS ALL SEAMLESSLY INTEGRATED.

The car is a prime component of the Internet of Things and connecting devices and services in the vehicle is the paramount objective of the connected car.

At the forefront of the next generation of connected vehicles are services for vehicle remote access, control, location services and security. Advanced location aware, real time navigation systems are standard options, while cars also feature integration of smartphones, apps and services from Apple and Google's ecosystems.

Connected entertainment and access to cloud content is also defining in car entertainment services and as the connected device ecosystems expand, consumer demand for always on connectivity and seamless integration in the car is now pivotal.

Engineers and developers are investing more and more time ensuring robust connectivity between cars, mobile devices and infrastructure. Consumer expectations, platform reliability and safety are all equally important in meeting these demands.

Throughout the development chain the challenge is ensuring end to end interoperability for all connected devices and services. From semiconductor and silicon solution providers, through phone and mobile device companies, hardware and software architects and the solution developers, all now work together to drive new services and innovation in the connected car.

Today's interoperability test methods assist developers to evaluate connected devices in use, to gather and then to analyse the data that is captured. These test processes can be complex and labour intensive and the challenge is to recreate complex consumer use cases where multiple factors can be simultaneously at play.

The connectivity features in today's connected car have multiplied at an astonishing pace, and in car connectivity

systems often require hundreds of individual test cases - double the number compared to just five years ago. With mobile devices, phones and tablets and wearable technology, connected vehicles are integrating more connectivity features with each iteration.

The standard process of interoperability testing can often be highly reliant on manual processes to simulate the end user experience. And emulating interoperability performance over many repetitive cycles, for example to provide an aging profile for device connectivity over time, still involves many hours of engineer test time to ensure the highest quality end user connectivity experience.

NextGen's solution, Automated Test Application Manager (ATAM) – is an innovative new system for automated interoperability testing.

## ENGINEERING NEW OPTIONS

ATAM changes the way that developers and interoperability test engineers will work, opening new opportunities and test cases for deep cycle and complex scenarios.

ATAM enables control and automation of mobile devices, built on NextGen's experience of providing mobile device interoperability services to some of the world's best known automotive companies.

Based on this experience, NextGen have created ATAM, an entirely new interoperability test solution to:

- Control in vehicle systems and mobile devices by emulating real end user interaction



- Create automated test plans which allow high repetition and complex use cases
- Simplify test procedures and shorten the time needed to effectively test in vehicle systems.
- Help manufacturers benchmark systems to ensure more robust and reliable performance
- Provide new ways to build test cases, increase efficiency and reduce costs.

ATAM opens up new and more efficient test processes, examining and exercising the connectivity features and functions of today's infotainment systems. ATAM is a software and hardware solution with desktop and mobile software components. ATAM controller hardware automatically operates mobile devices and in car multimedia systems. The PC based ATAM Desktop Manager creates test sequences for all current connection technologies including Bluetooth, USB Wi-Fi and proprietary interfaces.

The ATAM automation solution comprises the ATAM System Controller, connected to target mobile devices and in car systems. ATAM Controller is also synchronised to the ATAM Desktop Manager for test specification, data management and project control.

Connections for different target systems and mobile devices allow unprecedented levels of automated control.

The ATAM controller features a high resolution touch screen display, and is built into a strong but lightweight alloy chassis and offers multiple wireless and wired digital and analogue interfaces.

## MULTI-STANDARD SUPPORT

Connections on the front and rear of the controller provide USB, Bluetooth, Ethernet, Wi-Fi, Audio IO, with add-ons to support video cameras and visual monitoring. Vehicle connectivity systems are controlled and monitored using CAN and LIN interfaces, as well as switching I/O with customisable control and configuration. ATAM can interface with other industry standard test equipment, for example Bluetooth analysers from Ellisys & Frontline.

ATAM's user interface provides powerful and intuitive control of test sequences and data using a logical, drag and drop, graphical user interface. ATAM's UI allows the engineer to focus on creating the test, without requiring complex scripting or coding.

## DESKTOP MANAGER

ATAM Desktop Manager is a PC-based management suite that features a workflow based approach for functions. Desktop Manager suite combines test definition and configuration, test execution and data analysis modes into a logical and intuitive environment creating a new standard for automated interoperability testing.

Using ATAM Desktop the user creates test flows by accessing online device libraries and defines the target test device capabilities. The user will either load an existing project to modify, or can create new test projects from scratch. A graphical representation of the test process is created, dragging and dropping elements to create complex test sequences and to prepare for test execution.

When ready, the ATAM Desktop Manager transfers the test sequences to the ATAM System Controller. The System Controller executes test plans and several ATAM Controllers can be setup to work in parallel.

Each ATAM Controller precisely executes the automated test program, with complex simultaneous interactions and high repetition tests all executed in controlled order. Precision time-stamped systems monitor and log all data and testing results. ATAM has configurable feedback mechanisms and can notify issues found while ATAM is testing and can automatically alert the project engineer in real-time. Since ATAM can work around the clock, notifications can be configured to align with normal working hours.

When test sequences are complete, ATAM Controller returns all results and data collected to ATAM Desktop Manager for analysis, collating all gathered data and providing interoperability reports and global overviews. Individual test results can be examined in detail

with the status of all interoperability modes and device status and communications timestamped to be analysed in parallel.

## ATAM SYSTEM CONTROLLER

ATAM's ability to control automotive infotainment systems and mobile devices provides automotive and chipset customers with new test sequences and ways of testing and validating the performance of hardware and systems in new depth.

By intelligently managing the background tasks and automating test processes wherever possible, ATAM can complete test sequences with high repetition and will work round the clock delivering results, freeing engineering and development teams to focus on core issues and analysis.



## NEW TECHNOLOGIES, NEW CHALLENGES

Integration of smartphones and apps in the car are creating exciting possibilities for the consumer, while at the same time posing multiple challenges for the automotive development ecosystem. With mobile devices supporting Apple CarPlay, Android Auto and others, ATAM is ideally placed to address the challenges of interoperability with OEM integrated systems and services.

ATAM provides ways to robustly characterise and define performance of technologies as they interoperate, and, for the first time, ATAM can emulate complex crossover and boundary conditions that have previously been very hard to model.

ATAM provides the solution to such complex interoperability by allowing multiple automated device control sequences to accurately duplicate and recreate a multitude of possible complex end user interactions that, with manual testing alone, have not previously been viable.

ATAM provides deep data analysis, illuminating complex connection scenarios and deep cycle repetition. ATAM's automated test routines can replicate extended periods of use, allowing insight into the ageing profile of a product or system during the product lifecycle. Recognising tools which are familiar to every interoperability engineer, NextGen ATAM also works with and enhances other industry standard tools to provide even deeper analysis.

Integration between ATAM and standard test equipment gathers control and data channels and transports into a single analysis layer allowing a diverse range of use cases. Whether it's a car manufacturer de-bugging an infotainment system, a phone or mobile device manufacturer testing a Bluetooth or NFC pairing solution, or a semiconductor company proofing a new, multi standard System on Chip, wireless engineers are using ATAM to view multiple test and evaluation technologies with new focus.

Automation of the test processes using ATAM not only improves efficiency but opens the possibility to creates new test scenarios that model complex interactions and multi-use cases which have previously never been possible.

ATAM's elegant architecture make the solution surprisingly cost-effective, and is built to be intuitive and flexible. ATAM's ability to automate test control provides deeper levels of analysis. And by reducing manual tasks, ATAM allows project engineering teams to focus on the core issues. ATAM represents the new benchmark and is the ultimate solution for automated interoperability testing.

[www.nextgen-technology.com](http://www.nextgen-technology.com)



# NEWS

## FORD INVESTS IN PIVOTAL TO ACCELERATE CLOUD-BASED SOFTWARE DEVELOPMENT

Ford has made an investment in Pivotal, a cloud-based software platform company headquartered in San Francisco, saying that this will further enhance its software development capabilities and deliver innovations to customers more quickly.

In line with our observations elsewhere in this issue regarding the car companies desire to earn money in ways other than just selling cars, Ford states that the \$182.2 million investment in Pivotal aims will help drive Ford's transition to an auto and a mobility company. Ford admits that the company is aggressively pursuing emerging opportunities through Ford Smart Mobility – its plan to be a leader in connectivity, mobility, autonomous vehicles, the customer experience, and data and analytics.

Mark Fields, Ford president and CEO commented, "Expanding our business to be both an auto and mobility company requires leading-edge software expertise to deliver outstanding customer experiences. Our investment in Pivotal will help strengthen our ability to deliver these customer experiences at the speed of Silicon Valley, including continually expanding FordPass – our digital, physical and personal mobility experience platform."

Ford recently teamed up with Pivotal to deliver FordPass, which launched last month. FordPass will offer new customer services, like remote access to vehicles through a smartphone app, and mobility solutions, such as parking and car sharing. Pivotal and Ford IT engineers are apparently working side-by-side to create new consumer experiences for FordPass members.

Ford plans to accelerate the incorporation of Pivotal's software development methodologies and technology across the IT, product development, and research and

advanced engineering teams. Ford will put Pivotal's next-generation cloud platform and analytics capabilities to use on the company's new mobility projects.

We're not sure the traditional F-150 customer will be aware of this, or care about it, but Ford highlights the fact that software plays a growing role in new vehicles as demonstrated by the all new F-150 that features more than 150 million lines of code, whereas a typical smartphone operating system has approximately 12 million lines.

In addition, Ford and Pivotal plan to open new software labs in strategic locations in both the United States and Europe. The labs will be staffed with software architects, engineers and user experience experts.

## HERE EXTENDS PARTNERSHIP WITH TOYOTA MOTOR EUROPE

HERE, the location cloud company, has announced that Toyota vehicles equipped with the new Toyota Touch 2 with Go multimedia systems will be powered by map data from HERE.

New for 2016, the Toyota Touch 2 with Go multimedia system was designed and built by HARMAN. The system is claimed to offer drivers improved UX and connected services, and also offers free map updates for the next three years via HERE's MapCare program. Drivers have access to 2D or 3D mapping, real-time connected services and a range of apps accessed through new menus. Registration and connection to the My Toyota Customer Portal means that accounts can be created and applications installed directly from within the car, and MapCare updates downloaded.

Jean-Jacques Serraf, General Manager at Product Management Division in Toyota Motor Europe told Connected Car, "HERE map has been selected to power

our new Toyota Touch 2 with Go system due to the richness of its digital map database. HERE is a long-standing partner which always provided quality maps in Toyota's vehicles in Europe."

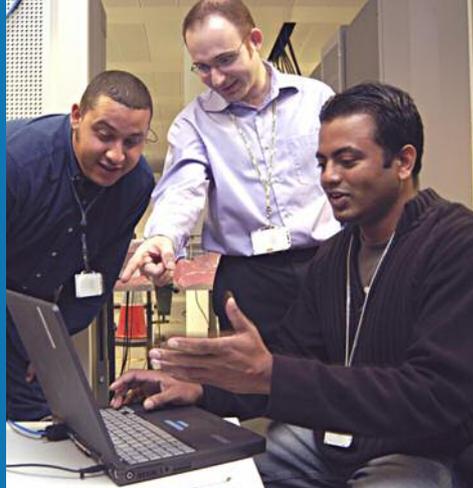
Launched in 2009, HERE MapCare ensures drivers get access to up-to-date maps, and some 29 vehicle brands have since joined the program. To date, more than eight million vehicles have been sold equipped with the benefit of MapCare.

## FCA OFFERS APPLE SIRI EYES FREE FEATURE THROUGH UCONNECT SOFTWARE UPDATE

FCA Uconnect is releasing a new complimentary software update designed to add Apple Siri Eyes Free capability to the vehicle's Uconnect system for nearly two million Uconnect equipped vehicles dating back to the 2013 model year.

Tricia Hecker, Global Head of Connected Services, FCA told Connected Car, "With the addition of the Siri Eyes Free feature for later model-year vehicles, more customers will have an opportunity to integrate their iPhones with Uconnect while keeping their hands on the wheel and their eyes on road. By adding Siri Eyes Free capability, customers will be able to use their voice to dictate and send messages, select specific songs, create reminder notifications and set calendar entries."

Drivers can activate Siri Eyes Free from the voice button on the steering wheel and speak natural language voice commands to send text messages, play music, set reminders, place phone calls and access turn-by-turn directions. Drivers will simply push and hold the voice recognition button on the steering wheel until the Siri screen appears on the 8.4-inch touch screen and the user hears the audible tones. Siri Eyes Free is compatible with an Apple iPhone 4s or later.



## CONTINENTAL INTEGRATES GESTURE-BASED CONTROL INTO THE STEERING WHEEL

Gesture-based control is already known from the world of entertainment electronics and has been making inroads into vehicles for some time now. Further development of this new control system in the car is being carried out by Continental. This year, at the WardsAuto Interiors Conference held in Detroit during May, Continental unveiled an innovation project that focuses the detection zone of gestures on the steering wheel. This is possible due to a time-of-flight sensor, which is integrated into the instrument cluster.

Where previous gesture-based control systems in the area of the centre console meant that drivers had to take their hands off the steering wheel or take their eyes off the road, Continental's system brings the controls to your fingertips while your hands remain on the steering wheel.

The new operating concept integrates with the HMI and can replace other elements such as buttons or touch-sensitive surfaces on the steering wheel. Instead, it uses two transparent plastic panels – without any electronic components – behind the steering wheel, which a driver can operate with their thumbs, almost like a touchpad. As a result, says Continental, a driver will benefit from intuitive operation, while vehicle manufacturers benefit from optimized system costs for operating concepts. The clear design of the panels is said to be compatible with almost any control geometry.

The time-of-flight sensor detects the motion of the hand and converts it into actions. The driver can navigate through the menus by swiping up and down, and confirm the selection with a tapping motion. Touch-free operation is also possible for other functions. For example, if the driver moves his fingers up and down in a uniform

movement while keeping his hands on the steering wheel, he can accept calls or reject them.

A gesture is typically a movement linked to a specific property. Thanks to the time-of-flight sensor integrated in the instrument cluster, this development from Continental has a high rate of gesture recognition. The sensor comprises a 3D camera system with an integrated 3D image sensor and converts the infrared signal detected by the sensor into a 3D image.

Consequently, the hand positions and gestures of the driver are detected with millimeter precision and converted to actions.

The system can currently detect four different gestures: setting the navigation, browsing through apps and starting music, answering calls, and controlling the on-board computer.

## TIER 1 SUPPLIER ROLE QUESTIONED AS ADAS ECOSYSTEM EXPANDS

Market intelligence company ABI Research suggests that Tier 1 suppliers are losing their roles as system innovators and developers in the nascent autonomous vehicle market. This is occurring as more OEMs engage directly with software developers and hardware and semiconductor vendors.

James Hodgson, Industry Analyst at ABI Research told Connected Car, "It is becoming increasingly evident that no single Tier 1 supplier can deliver a complete autonomous driving system. As a result, OEMs are increasingly engaging directly with component vendors, and becoming more aligned with product roadmaps from across the value chain. But Tier 1s will not disappear completely and still hold an important role in functional safety, one which requires a more overarching and holistic view than any component vendor can hold."

Hodgson went on to suggest that, in fact, the growing engagement of OEMs with component suppliers may prove more of a help than a hindrance to Tier 1s. This will be as OEMs increase their awareness of the capacities of the various components that constitute ADAS systems and the level of functionalities that they can feasibly achieve.

Evidence of OEM commitment to autonomous driving is apparent from recent M&A activity. This includes the purchase of HERE maps by Audi, BMW, and Daimler and GM's purchase of Cruise Automation, showing that, where necessary, OEMs are willing to own parts of the ADAS value chain in order to secure the necessary assets to enable autonomous driving.

ABI believes that the ADAS ecosystem will be further disrupted by the entry of newcomers to automotive, as the increasing sophistication of ADAS necessitates greater processing power, attracting vendors such as NVIDIA, Qualcomm and Intel to join the ADAS semiconductor market currently dominated by NXP and Renesas. Such vendors have a clear strategy of entering the vehicle via the infotainment system, before building the relationships and demonstrating the competency required for safety-critical applications in ADAS. However, this approach is not unique to newcomers, as Hodgson explained, "There is a growing trend in which incumbent players reposition or widen their automotive product portfolios to extend beyond infotainment. For example, recent hires and product launches by Visteon and Harman, vendors traditionally known for their infotainment offerings, signal an attempt by these companies to improve their growth through entry into ADAS."



# AUDI – COMMITTED TO ADVANCING TECHNOLOGY

## INTERVIEWEES:

*Dr. Peter Steiner,  
Head of Audi  
Electronics Venture*



*Marcus Keith,  
Director Development  
Operating Systems  
Audi Connect*



Audi has a long-established – and it should be said, fondly respected – reputation for embracing technology. After all, 'vorsprung durch technik' must be one of the most well-known slogans in the history of automotive advertising. Audi is also one of the three German car companies (the others being BMW and Daimler) that combined to buy Nokia's HERE mapping service in 2015. In recent times Audi has received a lot of praise for Audi Virtual Cockpit and its latest generation display systems. Vince Holton spoke to two Audi executives - Dr. Peter Steiner and Marcus Keith - to discuss Audi's vision for connected car technology, and the challenges of supporting Audi's own sophisticated and highly-optimised systems alongside Apple CarPlay and Android Auto. Audi also supplied an A4 3.0 Quattro so that Connected Car could sample its latest in vehicle infotainment systems. Our video feature will be published soon.

As Dr Steiner and Mr Keith shared talking duties throughout the interview, we have combined their responses below.

**VH:** Audi is investing a great deal of time and effort in infotainment and connectivity systems. What is the end goal and what is your vision for the way the end user experience will evolve?

**AUDI:** We are coming from a time when we only had one display in the car, usually too small or certainly not the right size. More than a year ago Audi agreed upon a clear strategy that really talks about not just displays but the whole driver experience. This includes Audi Virtual Cockpit in the larger cars, two displays in the console and also a head-up display. That means the driver-centric area is

enhanced by a tremendous amount of display area. This helps not only with the task of driving but also with managing information. We had worked out that on the systems side, an offline system simply did not work anymore. At a base level, for example, you have to have real-time traffic information in your navigation system in order to make the driver happy by avoiding traffic jams. We also figured out that we had create an ecosystem that allowed us to get the Internet and Internet apps and services into the car system. A great example is parking. Most of the time in cities today you drive around, trying to find parking, and when you do, the car parks are

full. We integrated parking information with the navigation system so that the driver is re-routed to an available parking space. We are continuing to develop this system to add street-side parking spaces, in order to further reduce the time a driver spends trying to find a parking space.

**VH: Do you see it as Audi's responsibility to develop these apps, or will happen as a result of Audi cooperating with external developers?**

**AUDI:** The next couple of years will be really interesting. We want to go the way of the open platform. We want to tap into the same, crowd-sourcing energy that is underpinning the development of Apple and Android apps. That means that we are working on an open system platform, alongside HERE. There are different ways to work with this. One way could see us making this platform available to other manufacturers to use. This would be nice for the automotive OEMs as they had just one interface they have to implement, and on the other side the app creators would just have one platform to develop for. This gets us away from each automotive company having to approach each app developer. For example, when we (Audi) talked to Spotify, it was very interesting. Initially they were not interested in talking to us, because they had already had this nightmare with Volvo, with BMW and with Mercedes. With each new automotive company they had to re-write source code and the API/interface. As a result, they were very interested in the idea of finding one single body to work with to create an interface.



Another way – the way that happens today for Audi and everyone else – is to work with the interfaces that exist from Apple and Google. So far, we're not too happy with the Generation 1 solutions from Apple CarPlay and Android Auto. Firstly, this is because they are mirroring our own system, so the customer is seeing and switching between two interfaces in one screen. Secondly, there is no ability for a premium OEM to influence the look and feel of the customer experience. Then, third, and this has also come as feedback from our customers, our colleagues at Apple and Google are only supporting one display. At Audi we are not developing for just one display, we are developing for the entire space in front of the customer, including the head-up display.

We are now talking to Google about Generation 2 of Android Auto, and the concept of Google Embedded. This could open up a possibility for us to gain access to a huge, open app community, while at the same time with Google Embedded we could embed the apps directly in our own ecosystem in the car, including the option to adopt our own look and feel. Overall we see such developments as positive, because in the wider environment the consumer electronics and automotive industries are working closer together.

**VH: Is Audi sympathetic with Ford's open-source programme with SmartDeviceLink, which is now being adopted by other car companies such as Toyota?**

**AUDI:** We've watched this, and there has been a lot of discussion inside Audi, but, you know, they are still facing the issue that an App developer still needs to change code inside his app or otherwise it won't talk to the API provided by Ford. Which raises the question – is the app developer willing to do that? This is against every idea of what constitutes an open-source platform.

There are really two possibilities. Number 1 – we automotive OEMs combine all our efforts and create one open-source company with one clear interface to write to, or Number 2, we find a way with Google Embedded – and perhaps an Apple Embedded at some time – where we also get one interface and retain our own look and feel and our own ecosystem of customers.

Basically, though, Audi's position is not to use the mobile device anymore. Today, there is a reliance on the smartphone, and when the smartphone is connected to the car, the car can see and access its content. If the smartphone is not connected, you have a pretty empty system.

So, everything will be based around cloud solutions, taking away the need to communicate via a consumer's mobile device. We're looking for a standardised solution for the whole automotive industry.

**VH: Who is driving connected car development? Is it the car companies, the mobile device companies, Apple or Google, Tier 1 suppliers and application developers or network operators?**

**AUDI:** This is a big elephant. Let's slice that big elephant up into some digestible topics, perhaps four of them. First is connected infotainment, second is car-2-X services, third would be cloud intelligence services and fourth would be piloted driving.

Starting with number 1, connected infotainment. As a result of finding a way to the open platform, in the next couple of years there will be a couple of technical possibilities to really enrich the customer experience, having all these services in the car, embedded in the system as apps, but online. This is being driven by both the automotive industry and by the consumer electronics industry, which both need to find ways to work together.

Number 2 – which could be car to smartphone for remote control, or car to charging stations if you have an electric vehicle. Or perhaps car to repair, maintenance or emergency services where you have a connection to a call centre, which can already see what is going on with the car and send an Over The Air (OTA) update or whatever other assistance is required. This is clearly driven by the automotive industry, nobody can help us there. It is a case of integrating these new services with existing hardware and software in the car. The big questions are: what will be the operating system (OS), what will be the build-up stack of the software and does it fit into the demands of normal computing software stacks? At the moment we have a lot of embedded software from different suppliers like Continental and Bosch and the question will be: how can we develop this into a standardised car OS? We need to learn like we learned from Android and Apple. This is a challenge, and we need to make sure that this push is driven by the automotive companies.

In the third scenario, where cloud services and cloud intelligence are concerned, we see cooperation with companies like HERE and Neptune. We would put a lot of information on the HERE HD map layers. Information such as traffic jams, ▶



icy road conditions and so on, and we would send that back to the customer. This will be a joint effort. It could possibly be open source or open platform so that other developers could also write code, but we will be writing software by ourselves, and it could be something that only one OEM is using, or it could be a common platform that many are using.

For the fourth topic, piloted driving, I think this is one of the most interesting ones. We gained a lot of publicity when we showed our first self-driving at CES in Las Vegas several years ago. We started a lot of discussions, and everybody is now moving in this direction. We will be bringing the first car with piloted driving onto the street in 2017 – not completely automated driving but at speeds up to 60km/h in traffic jams. We also see moves in this direction from consumer electronics companies in Silicon Valley – Google Car, for example. We see this competition as a good thing as it is speeding up development of autonomous driving technology.

**VH: At this time, most car companies seem to be accepting that they need to provide support for Apple CarPlay and Android Auto. Will this continue, or would the car companies prefer to take control through developing their own competing solution such as SmartDeviceLink (Ford/Toyota)?**

**AUDI:** We have built close relationships with both Apple and Google over the last 10 years. The relationship with Google is way more open. With the Open Automotive Alliance we have been able to have discussions about our technical standards for Android Auto and have worked with the Google engineers to generate templates for the more than 400 apps already generated for Android Auto. At the same time, we have been able to work with Google as they develop Google Embedded, and this is all helping to bring the two industries together.

With Apple, they have the behaviour of a closed system, and this continues into integrating their system into the car. We have integrated CarPlay into Audi cars, but we consider it a really reduced customer experience – just one screen and not connected to the instrument cluster or the Audi Virtual Cockpit or the HUD. The customer is getting a really limited experience. Also consider that at a higher level, when the Audi navigation system is active, we are able to guide the lighting or the shifting of the transmission and especially the characteristics of the drive train – whether that is diesel/petrol or electric – which can be influenced or adapted by the navigation. This is really important for the customer. If he or she is using Apple navigation he is not benefitting from any of this intelligence that we have built into the car. Using CarPlay navigation the driver is just using a simple, smartphone application, and that is just not good enough.

Later, Audi would like to bring its own navigation app onto the smartphone, and then we will run into direct conflict with both Apple and Google, because they want to promote their own nav systems and to get data from us to support their own systems. But we need that data to support our own sub-systems, which are connected to the nav system.

At this time the nav system demarcates the border line of a conflict between strong players including Google and Apple as it is decided how to get the nav system connected to the car.

**VH: Isn't this situation complicated by the fact that while you have your own, highly-developed and sophisticated navigation system, you provide a deep level of integration with Google by offering Google Maps in your cars.**

**AUDI:** This is just simple integration of one layer of Google's ecosystem, though it does help guide a driver through complicated street areas. It is just like putting a carpet on top of our professional navigation system, which is based on HERE maps and profiles from

other sources. We experienced high demand for photo-realistic maps from US customers and so we did this. It is just for decoration!

**VH: Have you already implemented the nav system-based influence on the car, based on braking, location, conditions, topography etc? Is that already across your range now?**

**AUDI:** It is already implemented, but it's not black and white. The functionality is in the car, as is the data from the navigation system. The Advanced Driver Assistance Systems (ADAS) data that we are putting on the CAN bus of the car today is used, for example, by our intelligent lighting system, which we call Matrix. This helps when you drive around curves, and when you reach speed reductions and go into inner cities the navigation knows to shut off the Matrix beam. Another example is CO<sub>2</sub> reduction of gasoline engines. We are currently developing a more advanced start-stop system which will shut down the engine when we go into a lower speed area. This is the nav system telling the engine 'you are now in a reduced speed area, you can shut off'. These systems are enabled by the ADAS-grade maps, and these are just the beginning of further integration that is already happening with the development of the HD maps. These will give us way more detail, and allow us to develop many more solutions for ADAS.



**VH: Audi has developed its own tablet platform for rear seat passengers. What were the motivations behind the initiative and how do you intend to stay competitive with other consumer devices such as the iPad? Why not just use the iPad as a platform?**

**AUDI:** This was started by discussions around systems for rear-seat passengers in the new A8. Up until now, most functions in the car have been controlled by the rotary controller on the centre console. We're very concerned about meeting the expectations of the passenger in a D class car such as the A8, and we didn't feel that leaving them without an option to control car systems was an option. We also didn't want to say to them that they could just use their iPad. Managing some functions of the car via an app on an iPad or other tablet in other cars in the Audi range is something we are looking at, but this wouldn't work for the A8 customer.

You know this type of customer – they want to have a comprehensive service and they don't want complication. In days gone by we would be talking about DVD-based entertainment and operating the infotainment remotely from the rear seats. But times move on and now we have demands for surfing the internet, gaming, watching online movies from Netflix or Amazon Prime, rather than watching analogue or digital TV broadcasts. The world is turning digital and we wanted to offer our customers appropriate

solutions in this area. There were also safety concerns. Forcing our customers to use their iPads is not safe because of the glass they contain, which could be very dangerous in the case of an accident. We wanted to allow our customers to do similar things to what they would do on an iPad, but in a safe manner. The outcome was to offer a deeply integrated, hybrid solution based on an open platform on which you could install any Android application, for any purpose.

To give you some more background, there is, for us, a 'happy face' side, and an 'unhappy face' side. Let us explain. We have been able to use the Android OS in this tablet and to have our own area of Audi UI where the customer can manage functions of the car, such as sending destinations to the navigation system in the car. At the same time, for an Android customer, using this tablet will be a great experience as he or she only needs to have one set of apps that can be on their smartphone and on their tablet. These apps will be synchronised on Gmail, the Amazon Prime account will be synchronised, Spotify etc, and this will all be available on the tablet in the rear of the car – an integrated mix of Audi functionality and Android functionality. So for Android customers, we as Audi developers are very happy – that's the happy face.

We are, though, very unhappy for a huge number of Apple customers. The reality is that we have more Apple customers than Android customers, but with Apple there was no way of having this same discussion. We said 'hey, Apple, can you open your system and let us do the same for our customers as we have with the Android guys? We want to have the same, seamless integration.' There was a clear 'no' from Apple, so we were forced to use the Android system.

Overall, though, we are happy with the tablet solution we have developed, and plan to update it every two years.

**VH: How will 5G cellular wireless technology change the communication between the car and back-end data services given the higher bandwidths?**

**AUDI:** We think that even before 5G arrives we will have lots of opportunity to work with the telecom companies to enable better connected car systems. I think the telecoms companies have now woken up to the big opportunity for their businesses. Internally we are already talking about an LTE-V (Vehicle) solution for our cars. This would enable the so far unfulfilling discussions regarding V2V systems to be picked up, and for the technology to be easily regulated and maintained by the telecoms companies, not the car companies. We have been offered a frequency band (802.11p), but for 10 years we and the other car companies have been talking about whether or not to use this as a standard. In the meantime, the telecoms companies has developed and rolled out 4G, 5G and so on, and in 5G there are much better solutions to serve the automotive industry. They are providing defined Quality of Service (QoS), so that if you book a 1MB/s connection, that's what you will get, any time, under any circumstances. This functionality can be implemented inside the 5G network and is what we need for the connected car, especially when you are considering automated driving. In that environment we will always be pulling information from, or sending information to the cloud – so we need these reliable, defined connections.

Our discussion with the networks tell us that if, for example, we have a Vodafone data connection, it will be able to tell us that QoS is guaranteed for the next 'X' number of kilometres, but should there be a dip in service they can and will switch or roam us to other, competitor networks if their base station fails to maintain the connection. We will have real, high-quality information about the connection status of the vehicle to the cloud. This is vital for safety reasons as we develop highly-automated driving, and is not available on 2G and 3G networks, which were not developed with the car in mind.

The 5G networks are, then, much better adapted to our needs.

**VH: Are the NetOps investing enough, and quickly enough, to bring 5G networks to reality in the timescale you need?**

**AUDI:** We think so, but it will take a while - we are talking about 2020. Meanwhile we are having discussions with them and we are finding some really good, open-minded people at the network providers. We have been talking about using LTE-V to bridge until 5G is available. They are also telling us that there is life in LTE yet as they haven't stopped developing it, and that there are more possibilities with the 4G networks.

We've also found a nice application for car customers. The net-ops have been developing low power LTE and have developed smart devices with a 5 year battery life that can be installed in parking spaces. Up to 50,000 of these devices can be distributed within one cell. You can then gather all of the data and solve one of the car driver's biggest ongoing problems – parking! We are having this discussion with both the net-ops and the cities.

**VH: What are your thoughts and preferences on the next generation infotainment system operating systems?**

**AUDI:** This takes us back to our earlier discussion regarding the development we did for the rear-seat tablet, the connection to consumer electronics and managing the 2-yearly updates. We developed our so-called modular infotainment platform back in 2012. We're already working on the 3rd generation, 2017 version for the new A8 launch. We have been putting the latest and greatest CPU technology into that system. It was very important to us to have the latest computing technology in the car so that the car systems always function how the customer wants them to, and when they want them to.

We had a clear vision of simplifying processes, reducing unnecessary functions, exchanging mechanical control functions for voice control. The goal was simple - using the system must be easier. We did a lot of customer clinics, comparing the system we brought out in 2012 with the system we just brought out in the Q7. Finding and starting the navigation in the new Q7 system needs two or three clicks, compared to seven in the old system. Ease of use – and therefore safety for the driver - is the most important target. A lot of resource is allocated to this, and we maintain ongoing consumer research and technical discussions with outside bodies such as the NSA's Traffic and Driver Distraction officers.



This research is all vital, because there is no point developing all of this technology and putting it in the car if nobody is using it. There is nothing worse than hearing a customer say 'Oh, you have XYZ system in the car – I didn't know that'.

So we've done a lot of work on the OS for the A8 launch next year. ▶

We showed a little bit of it at CES this year, including the way it will look, and I can tell you it is very nice and very easy to operate. There has also been a lot of development on speech recognition. Current speech systems are on-board in the car, and you need to programme every source-code menu for every use case. Our new speech system will be cloud-based with a learning algorithm. These systems, which we are learning about and developing now, will also be used in the piloted driving systems that we will use.

**VH: BMW is already talking about the fact that it is evolving into a digital platform provider. Will connected car technology be the tool that allows Google, Apple, Amazon et al to turn the car into a digital revenue platform model. Is this what we (the consumers) face?**

**AUDI:** We have been thinking about this, and bringing the data from the car into the cloud is one of the reasons we became part of the consortium of companies that bought HERE (Ed. – the other two companies were BMW and Daimler). We thought that by sharing the data our cars capture we can become stronger, and at the same time we can negotiate with the Googles, Apples and Amazons. There is also the possibility of exchanging data with them, while keeping our own automotive space clean, and we can operate our own, much stronger rules for privacy than are used in some other industries. We also want to continue to improve the quality of the HD maps and to introduce some automotive-specific services. So, yes, we do want to be able to generate a lot of revenue outside of the classic, car hardware business, based around mobility and the process of getting people from A to B.

In this way we have the same strategy as BMW, to expand our business outside of hardware and into software. So, yes, we need data.

**VH: Who 'owns' the data that is being gathered by a car, and who has the right to decide what is done with it? Is it the consumer who buys and drives the car, or is it the car company?**

**AUDI:** The data is clearly owned by the customer, and we also have to consider that the driver may not be the customer/owner. We have to care about both situations and clearly explain to both what is being done with the data. We have to have a license from both to share that data with others. There has to be full transparency, and there will be opt-in. There will be a separate menu for the data connection and you will be able to switch data on or off. It will be the same as buying an iPhone or other smartphone. You will be able to switch data off, but, just like the smartphone, if you do so you won't have access to a lot of the services – like HD map access - that are built into the car. This will be especially so, of course, when you are in an automated driving situation.

**VH: With much publicity recently about connected cars being hacked, how important is security, and who bears the main responsibility to provide it? How will Audi ensure that its vehicles remain secure and free from sabotage?**

**AUDI:** Security is like privacy. This needs to be covered by industry standards, and it cannot be any less state of the art than that used in any other mission-critical systems such as banking. We will use the highest levels of security available on the market. This is another reason why OTA technology is important. Your car cannot stay secure if you are not able to send it the latest security updates.

To keep OTA updates safe, files need to be encrypted. In addition to this, inside the car it is also very important to design firewall architecture so that driving computing systems are isolated from infotainment computing systems and other areas. At the same time there needs to be a security architecture for the way the information makes its way into the car.

Our clear target is that our cars need to be very safe.

# CONNECTED CAR SUPPORTS JAGUAR LAND ROVER DEVELOPER CHALLENGE



## A weekend-long developer challenge to help us create the connected future.

Connected Car magazine is delighted to be a media partner for Jaguar Land Rover's weekend-long 2016 Developer Challenge. This event brings together developers working to ensure that the Connected Future has a positive impact on people's lives inside and outside the car.

The event takes place at the Coventry Transport Museum in the UK, over the weekend of the 22-24 July 2016

Challenge entrants will create projects that will be judged against a combination of value creation, innovation, technical implementation, user experience, market potential, integration opportunity and presentation quality.

The judging panel includes Carl Pickering, Senior Manager, Research and Technology Strategy, Jaguar Land Rover, Dave Cox, Head of Innovation, M&C Saatchi, and Connected Car magazine editor, Vince Holton.

Connected Car will include a report from this event in the next issue.

If you would like to participate in this Jaguar Land Rover event, please use the following contact details. Entries close at 23:59 pm 8th July 2016:

devchall@jaguarlandrover.com  
@JLRdevchallenge  
#jlrdevchallenge

[www.jlrdevchallenge.com](http://www.jlrdevchallenge.com)

*Earlier this year, Connected Car spoke with Peter Virk, Jaguar Land Rover's Head of Connected Technologies & Apps, Connected Car. Click on the movie screen below to watch the interview.*



# GENIVI ALLIANCE: DEVELOPING AN OPEN STANDARD FOR ALIGNING AUTOMOTIVE AND CONSUMER INFOTAINMENT CYCLES

Vince Holton talks open-source with Matt Jones,  
President of the Genivi Alliance

**I**T'S LIKELY THAT CONNECTED CAR'S READERS WILL FAMILIAR WITH THE GENIVI ALLIANCE, THE NON-PROFIT INDUSTRY ALLIANCE COMMITTED TO DRIVING THE BROAD ADOPTION OF SPECIFIED, OPEN SOURCE, IN-VEHICLE INFOTAINMENT (IVI) SOFTWARE.

**GENIVI'S PUBLIC PROFILE STATES THAT IT IS ADDRESSING IMPORTANT AUTOMOTIVE INDUSTRY NEEDS BY ADOPTING OPEN SOURCE SOFTWARE METHODOLOGIES AND BEST PRACTICES AND PROMOTING OEMS AND TIER 1S USAGE OF THEIR OWN TECHNOLOGY ROADMAPS, BRANDING AND BUSINESS MODELS. TO LEARN MORE ABOUT THE ORGANISATION'S PRACTICES, GOALS AND OVERALL VISION FOR CONNECTED CAR TECHNOLOGY, VINCE HOLTON SPOKE TO MATT JONES, PRESIDENT OF THE GENIVI ALLIANCE. WHEN NOT WORKING ON GENIVI PROJECTS, JONES IS DIRECTOR OF FUTURE ENTERTAINMENT, JAGUAR LAND ROVER.**

**VH:** What are Genivi's objectives in the connected car space?

**MJ:** We have been going for 7 years and currently have about 130 active members. In the last 12 months we have expanded the free and open-source vehicle interaction project within the first areas of

connected car. When I say the first areas, I mean that so far we have been seeing lots of proprietary solutions coming out that are copying what has been happening in mobile devices and personal computers for many years. The Remote Vehicle Interaction project aims to provide free and open source solutions in three main areas. The first is being able to securely remotely control a car - i.e. how can I send instructions to a vehicle, or an embedded device within a vehicle? The second is how you securely enable an over the air software upgrade (OTA) for the vehicle, and the third one is how we can get all of a car's data into the cloud and allow people to use that standardized communications protocol in order to build the next generation of features.

The really good thing about the Genivi Alliance is that it is not a product, it is a set of building blocks that people develop products on top of, without new learning, and developers can pick up building blocks and turn those into a product. So, with the software OTA solution, for example, it focuses on providing some software management to the back end, puts files in places and tells the software which cars or devices need to be updated, and you get a report back. Genivi members like Bosch or Ericsson can then use the product if they wish, without needing to start their own project. ▶



The interesting part for Genivi has been that as we have been developing this communications protocol, we have been getting a lot of interest through the Genivi start-up programme – universities and so on – and we have ended up developing free and open-source instances in the cloud as well, so that you don't even need to get involved with developing a database. It really is an accelerator to get people using the next generation connected automotive features.

**VH: And has the reaction been positive?**

**MJ:** The reaction so far has been fantastic. We have the healthiest expert group within Genivi and already they have demonstrated the first active, working code - and all within 6 months. It is exciting to see companies such as Harman's Redbend working on this, because there is recognition that proprietary based solutions can't last, that ultimately the IP is going to be implemented on top of the transport mechanisms, and that it will help the industry to be able to lean back on an open-source industry standard.

**VH: How 'open' to the concept of open-source software have you found the automotive manufacturers to be? Have you been fighting 'walled garden' thinking?**

**MJ:** We have been working in open source from an embedded software perspective since we were formed, and in reality in discussions for 9 months before that. The important thing is that with open source we are not trying to take away people's right to IP. What we want to be able to do is give them the tools to accelerate creation of the new and innovate features that the car driving public wants.

I've asked at many conferences and events "who has ever bought a car because of the operating system?" Very few people have ever put their hands up. Very few people buy cars because of the OS. All cars use petrol or diesel and perhaps electric. All cars use a very similar set of components to make them work. All factories use the same tools to put cars together. Why wouldn't they use the same software building blocks, standard building parts that are not part of what differentiates a BMW from a Volvo or a Jaguar? Ultimately, by using open source software, it allows everyone in the automotive ecosystem – be they an OEM, or a Tier 1, or a new player that wants to corner the market with a new media player – to build their products faster and – crucially – to keep up with consumer electronics. It is the same as Samsung and LG selling mobile phones that look a little different and have different added values, but are based on the same underpinning Android software platform. So car companies can do the same, and this is Genivi's mission. OEMs and Tier 1s should be able to focus their resources, and should not have to be reinventing new radio players or software stacks. They should be able to focus on creating new and innovative differentiating features to give customers real choice.

We have been able to build an understanding amongst the members that if you take software developed within Genivi, and you enhance it, then you give something back. So Harman may end up using something that has been developed by Bosch, building on it, and then what Harman has added is also used by Bosch, and perhaps Continental or BMW – and whoever. That's all OK, because each of these members is passing on enhancements somewhere else.

**VH: This seems to be similar to the very unusual, collaborative and un-selfish ecosystem that was created amongst members in the early days of the Bluetooth Special Interest Group (SIG) in the connected device market, where seemingly competing members actually rolled their sleeves up and worked together to make Bluetooth technology and the Bluetooth SIG better and more**

**powerful. Bluetooth is now massively successful and has more than 30,000 members. Does Genivi share the same ambition and is this achievable in the automotive sector?**

**MJ:** We had that ambition, and now we are achieving it. We have a compliance specification, we write standards and we have multiple expert groups looking at multiple different areas of the infotainment system - e.g. media players, device connectivity, telephone stacks, navigation. We have code and reference implementations and over 2,500 engineers subscribed to our technical mailing list - and far more subscribed to the business related lists. As well as that, we release two updates to the compliance specification per year, so we are really running at consumer electronics industry pace with this. That is important as we need to understand how to interface with the consumer electronics industry.

I've not been personally involved with the Bluetooth SIG, but I believe that Genivi is now becoming an order of magnitude larger than some of the more exacting groups. We're also starting to have inter-alliance collaboration with the likes of the World Wide Web Consortium (W3C), the Open Mobile Alliance (OMA). They and other industry trade associations are coming to us, requesting cooperation. That's a really good sign. We also have close ties to the Linux Foundation – I am on the board of that organization.

**VH: There are signs, then, that open-source is becoming more accepted. How significant do you consider Toyota's announcement that it will adopt Ford's SmartDeviceLink software, with PSA following on, and others such as Honda, Mazda and Subaru apparently considering doing so too?**

**MJ:** SmartDeviceLink is a Genivi product, and so that is great, and shows how Genivi technology is being adopted widely. Ford and Toyota are not Genivi members, but anybody that uses an open-source Genivi product, anybody that contributes back – whether a Genivi member or not – is very welcome. It is great seeing open-source being used by multiple car companies, across multiple continents. We are not at all concerned that Ford and Toyota are not Genivi members, and ultimately, we hope that more car companies will adopt open-source.



**VH: Do you regard Genivi as a standards organization? Your collateral talks of projects and developing software, but is it Genivi's goal to define, maintain and regulate a documented standard in the way that bodies like the Bluetooth Special Interest Group, Wi-Fi Alliance, AllSeen Alliance do?**

**MJ:** Genivi is a code-lead, reference implementation. We don't believe in creating a standard on a piece of paper and then writing the code to meet standard. We believe in looking at what open-source code is out there and creating a standard based on that, as well as using standards that we can code to for modules that don't exist. If you can imagine a binary star system, and specifications orbiting code, that is close to the Genivi model.

We are all about enabling in the car the lifestyle that we have become accustomed to with our smart mobile devices. For this reason we are pulling stacks and technical specifications from organisations such as the Bluetooth SIG, the Wi-Fi Alliance, AllSeen, translating their technology into automotive.

**VH: In comparison to the PR 'noise' in the automotive sector that currently surrounds development of advanced driving assistance systems (ADAS), development in infotainment seems to be**

relatively low-level, or at least there is less noise. Would you say that OEMs are focusing more on ADAS, and diverting engineering resource to develop ADAS systems?



**MJ:** No, not at all. They are very distinctly different engineering teams and different skillsets. It's like the difference between the person programming the operating system in a handset and the person programming the operating system in the cell tower. It's that different. I would say, though, that Genivi recognises that in the future there will be autonomous (and semi-autonomous) vehicles. At that point, the driver will need more to do than they do today and in a safe environment. That's where the IVI system kicks in. Similarly, we recognize that the ADAS systems of tomorrow will need fantastic and secure connectivity to the web. Genivi is developing that through various of our projects. The information provided by the IVI is critical to ADAS and future features. We want our building blocks to not only benefit the IVI systems, but all of the systems in the vehicle.

**VH:** What alignment is there between the consumer/mobile device manufacturers and the Genivi Alliance, and what will this bring?

**MJ:** This goes back to meeting customer expectations. It's good to see that CarPlay and Android Auto have come along. The customer may be using an Apple or Android smartphone or something else, and wants that to work effectively with the vehicle. The great thing is that we already have wrappers and open-source projects so that the Android Auto and CarPlay interfaces work perfectly on a Genivi stack – in Android Auto's case, the wrapper was available within 3 months of Android Auto being released. Needless to say, because of the proprietary nature of Android Auto and CarPlay, while the wrapper is open-source, it does not allow you to download a fully working system without the agreement of Google or Apple. This is, though, where we need to be. Genivi needs to be a free and open-source operating system that enables whatever the customer expects. The customer could, of course, be the end-user of the vehicle, or any of our members.

**VH:** How does MirrorLink compare to Android Auto and CarPlay – is it competing or complimenting?

**MJ:** From Genivi's perspective, MirrorLink also works well on a Genivi platform. Ultimately it is up to the car company or Tier 1 to consider what their customer will need. SmartDeviceLink, MirrorLink, Android Auto and CarPlay are all equally important projects within the Genivi Alliance, and Genivi is scalable from the smallest display in a low-cost car to the multiple display systems now being installed in premium cars.

**VH:** The consumer electronics industry, though, traditionally moves a lot faster than the automotive industry. How will the Genivi Alliance enable development of in-car technology to keep pace with developments in the consumer world?

**MJ:** It's about alignment. Ultimately the car is a big, mobile device. That is how the customers see it – a big mobile device that interfaces to other mobile devices. We have gone beyond copying what is going on in the mobile device world, we are cascading requirements into the other alliances that are developing the next generation of tech for the consumer world. Then we will rapidly integrate emerging standards into the Genivi stack to ensure that all of automotive meets the customer's requirements and expectations.

**VH:** Security has been in the news. The stories we have been hearing about vehicle systems hacking have mostly identified the IVI system as the hacker's route into the vehicle. Does Genivi see security as an area on which it has to focus?

**MJ:** Of course. As well as having a dedicated security team, we have security in mind when developing all of our open-source solutions. Because Genivi is not a product, and because it is based on open-source, Genivi is based on the best open encryption that you would use for banking or defence. Genivi's isn't a proprietary description of security. The way I would describe it is to imagine you had a safe designer who designed a safe. The safe designer then got all of the other safe designers and some safe crackers to review the design of his safe – over and over again – until all of the safe designers and the safe crackers involved agreed that there was no possible way of getting into that safe. At that point the designer says that his design is free for anyone to use. This is the open-source model.

I would say that there are, of course, proprietary security technologies, and everything that Genivi does allows proprietary IP to be used as well. Once you use that proprietary technology to build your safe (technology that has not been peer-reviewed by thousands of people) someone can learn how to breach that safe's proprietary security and may well put the knowledge up on the web, and then everyone will know, as we have seen in the automotive and other industries.

One of the things we are talking about inside Genivi at the moment is that while this open-source encryption is really good, if someone did manage to crack it, you can track that fairly quickly. Then, if there was a proprietary 'safe' inside that encryption that somebody had chosen to put into the product and that nobody had ever seen before, this could create a good 'onion-like' security. Even if you were the 1 in 50 million people that could get through the open-source encryption and were confronted by something that nobody had ever seen before, that is good, and that is the way that the industry is going.

**VH:** OK, let's finish off with this. Genivi seems to be doing well at the moment. How are you going to maintain momentum? Is there sufficient commitment from the membership – and enough committed, big, powerful companies - to make full-time management of a standard sustainable on a long-term basis?

**MJ:** We've proven since we started out in 2009 that we do what we set out to do. Our membership has been growing, and has now stabilised, which is to be expected based on our knowledge of the size of the industry. We have code commitments coming in all of the time. We are not just seeing the first products based on Genivi being launched, we are seeing the second and third generations actually driving on the roads today. We are here for a while, to say the least. Our mission doesn't have a defined goal or an end-stop. We will continue to expand our activity, because, as new technologies and new features are developed in consumer electronics, in order to meet customer expectations we have to track and implement that technology in Genivi and subsequently in cars.

I don't believe that innovation in the mobile device industry is going to slow down any time soon.

[www.genivi.org](http://www.genivi.org)



**DENSO**

# NEWS

## QUALCOMM SNAPDRAGON 820A AND 602A PROCESSORS SUPPORT NEW GOOGLE IN-CAR PLATFORM

Qualcomm Technologies is working with Google on an initiative to bring embedded Android OS directly into the car. According to Qualcomm, the initiative aims to help car makers create infotainment systems using Android as a common platform, with the goal of making it easier to add connected services and applications while delivering a safer and more intuitive driving experience and accelerating innovation in the car.

Concept car functions were demonstrated at Google I/O run on the Qualcomm Snapdragon 820 Automotive processor for connected cars and infotainment.

Car manufacturers, automotive suppliers and developers can create Android-powered infotainment solutions using Automotive Development Platforms (ADP) for Snapdragon 820A and Snapdragon 602A processors. The ADPs will provide access to the platform for developing, testing, optimizing and showcasing next-generation infotainment solutions. Qualcomm claims that, using this platform, OEMs, developers and system integrators can significantly reduce their software development time and risk and begin final production software qualification earlier.

Patrick Brady, director of Android engineering, Google, commented, "Google is committed to building Android into a platform that fuels innovation in the automotive space. We are in close collaboration with industry leaders such as Qualcomm Technologies to bring the best of Android into the automobile in a safe and seamless way. This initiative represents the next step in bringing the power of an open platform and rich ecosystem that enables car makers to create powerful infotainment systems designed for the digital age."

"Snapdragon Automotive processors, combined with Android, will enable the

automotive ecosystem to create cutting-edge connected car and infotainment platforms," Nakul Duggal, vice president, product management, Qualcomm Technologies added. "Android as the infotainment OS in the car will allow drivers and passengers to interact with their vehicles in new and exciting ways. We are pleased to be working with Google and the automotive ecosystem to usher in the next generation of in-car experiences."

## STMICROELECTRONICS PAVES THE WAY TO SMART DRIVING VIA MORE SECURE AND CONNECTED CARS

STMicroelectronics has launched a new family of automotive microcontrollers that it claims heralds the advent of more secure and connected cars. These new MCUs bring Power Architecture-based devices manufactured in 40nm Flash technology dedicated to Car Body and Security applications.

A high level of scalability allows the SPC58 family to address the need for in-car automotive networks with high bandwidth and strong in-vehicle security. The devices combine Ethernet and ISO CAN FD communication interfaces with the latest Hardware Security Module (HSM) technology to ensure functional integrity of the car's ECUs, intrusion detection, and protection against malicious attacks.

ST's believes that its in-house embedded Flash (eFlash) 40nm process technology is ideal to integrate high performance and outstanding automotive-grade reliability in very small packages, enabling car gateways and body modules to be smarter, smaller, and lighter.

Fabio Marchio, General Manager Automotive Digital Division, STMicroelectronics told Connected Car, "The next generation of smarter cars will rely on electronic systems based on MCUs that provide the best combination of performance, low power consumption, high security, and robustness. ST's SPC58

MCU lines meet all these needs, making them the leading solutions for next-generation in-car controllers.

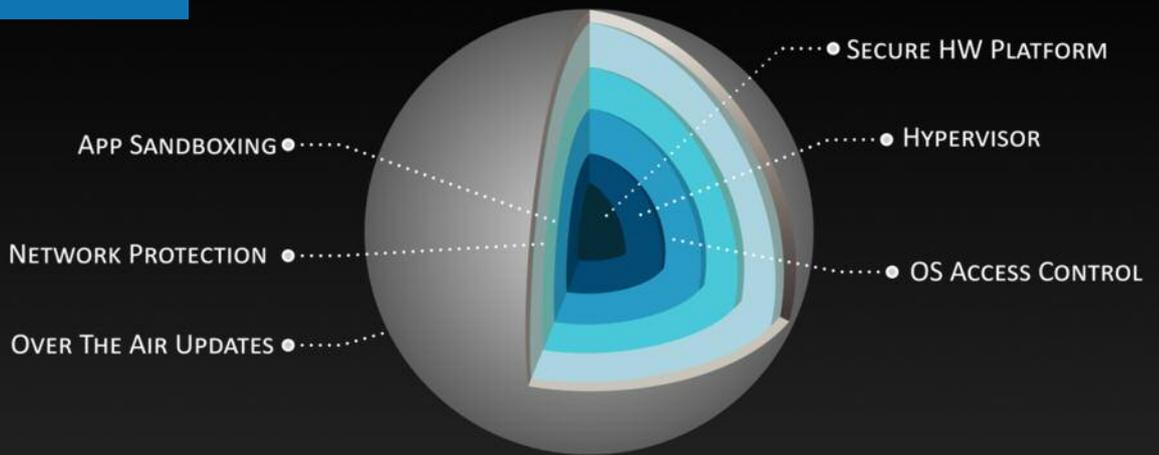
"Tomorrow's connected car will communicate with everything, from its internal systems such as transmission, advanced driver-assistance electronics, and front panel to roadside infrastructure, emergency services, and other cars. And it will have to provide the highest level of security. The SPC58 Automotive MCUs, with their unique combination of performance, connectivity, security, and scalability, allow car makers and their subsystem suppliers to set new standards in ensuring a safer, greener, and more enjoyable driving experience," added Marchio.

Samples of the SPC58 B-, C- and G-Line MCUs have apparently been provided to lead customers and full production is scheduled for Q1 2017.

## DENSO, ESOL, AND NEC COMMUNICATION SYSTEMS FORM JOINT VENTURE

DENSO, eSOL, and NEC Communication Systems are forming a joint venture to develop basic software (BSW) that can support high-speed data communication, high-quality security, and high-performance microcomputers, with the goal of advancing in-vehicle systems used for automated driving and other control actions. The joint venture will provide BSW to help automakers and Electronic Control Unit (ECU) suppliers increase their quality and efficiency when developing products. The joint venture, called AUBASS CO., LTD, will be located in Tokyo, Japan and will begin operation May 2016.

The companies explained that they decided to form this joint venture based on each company's know-how in the technologies that will be needed for in-vehicle electronic products, and felt that together they have sufficient experience to develop automotive BSW. As a result of the group's combined experience, the joint venture forecasts that it will provide highly competitive BSW.



# HARMAN: EXAMINING THE 5+1 CYBER SECURITY FRAMEWORK

Vince Holton talks with Hans Roth, senior director of technology marketing at Harman



Hans Roth, senior director of technology marketing at Harman.

**IN** ISSUE 3 OF CONNECTED CAR WE LOOKED AT SECURITY, AND IN PARTICULAR, FIAT CHRYSLER AUTOMOBILE'S (FCA) RESPONSE TO THE HACKING OF A JEEP CHEROKEE. THE SECURITY CHALLENGE, THOUGH, FACES ALL AUTOMOTIVE OEMS, THE TIER 1 SUPPLIERS AND THE ENTIRE DEVELOPMENT CHAIN. IT'S A BIG, BIG DEAL. A PRESS RELEASE FROM HARMAN LANDED ON MY DESK RECENTLY, TALKING ABOUT THE COMPANY'S 5+1 CYBER SECURITY FRAMEWORK. AS SECURITY IS CLEARLY IN THE SPOTLIGHT FOR HARMAN, I REQUESTED A CHAT WITH A COMPANY SPOKESPERSON. IT FELL TO HANS ROTH TO GIVE ME AN OVERVIEW OF HARMAN'S STRATEGY, AND THE RATIONALE BEHIND THE COMPANY'S ACQUISITION OF TWO AUTOMOTIVE SECURITY COMPANIES – TOWERSEC AND REDBEND.

**VH:** What is your helicopter view of the current state of security in the connected car sector?

**HR:** This is one of the main topics in the industry – everybody understands the importance. Every OEM is working on it, and at Harman we are in the middle of it with our 5+1 strategy. We started working on it very early and it is a great opportunity - but also an obligation.

I do not think the level of security in today's cars – the ones that are on the roads today – is acceptable. If somebody is determined to hack these cars, then they are able to do it. That said, it's not that easy. You can't just hack a car that is passing by, you still need quite a lot of engineering expertise and access to systems. But as

cars become more connected, providing good security will become more and more important.

Today's levels of security are not sufficient, because new forces, or threats, are coming. This will become easier as Over-The-Air (OTA) updates become more practical. With today's cars it is generally not possible to do OTA security updates. Harman is working with most of the OEMs and this is a very important part of our strategy.

**VH: Was the hacking in mid-2015 of FCA's Jeep Cherokee the wake-up call that the industry needed, or were the key players already aware of threats?**

**HR:** Well, there had been trials and hacks before this, but for sure, yes, the Jeep hack was a wake-up call to that part of the world that had not considered this as a threat to security up until that point. Certain OEMs had been working on security prior to this event, but perhaps not with the priority that they should.

**VH: And is the in vehicle infotainment (IVI) system the weak link in the automotive security chain?**

**HR:** No, it is not. The most vulnerable channel, for sure, is the On-Board Diagnostic (OBD) interface. There are many aftermarket tools that have physical access to the OBD. At the moment, the car key, the telematics unit and the infotainment system are currently the only ones that have wireless access to the car. These channels can be more easily protected with security updates via a software fix, either OTA or via USB, as has been demonstrated by BMW. So for current cars, I would not say that the IVI is the weak link. Once you start going into the vehicle network, security updates are much more difficult. None of the ECUs that are buried in the car can be updated at the moment. Until this changes in the next generation of cars, I believe that the OBD will be the weakest link.

**VH: Surely though, with all of the computers in today's cars, it should be easy to embed technology to detect and prevent hacking attempts?**

**HR:** Detect and prevent technology does exist, and there are a few companies that can do that. Harman acquired Towersec for its expertise in this area. Towersec's technology is used for prevention of attacks and was used as the benchmark for security by other companies. So for Harman it is now easy to implement this in our other products and for any ECU in the car. It is important to understand, though, that while it is now easy for us to implement, the technology behind it is definitely not easy to develop. It can be retrofitted to existing cars, too. You need to define the central gateway or another ECU to be the host and then you can enable the technology in the vehicle via a software update.

**VH: Is this something that is actually happening? Or is it just a concept?**

**HR:** No, it is happening. Many OEMs are showing an interest, either to implement in existing vehicles or certainly to do so with new cars.

**VH: OK then, where does the primary security responsibility lie – with car companies? Tier 1 systems developers? IoT/Cloud software developers?**

**HR:** I think the primary security responsibility lies with the OEM. They must make sure that the car never does anything unexpected and

must protect the car against attacks. However, the OEMs aren't able to do this on their own. The Tier 1s have to support the OEMs. Typically it is the Tier 1s that are developing the connectivity systems that could then be used as attack channels. Therefore the Tier 1s have a delegated responsibility to do everything they can to make the car safe. We talk to all of the OEMs and they are all working on security.

**VH: How would you summarise Harman's response to automotive security challenges?**

**HR:** We have been developing our 5+1 security suite for the last 2-3 years. This is available now and includes all of the various layers, including OTA updates. We are offering that suite to all of the OEMs, for any ECU and any vehicle.

**VH: How will the acquisition of Redbend help?**

**HR:** The Harman security suite covers various layers, from the internal hardware encoded and encrypted master keys to the boot layer, message control, the inner layers and applications, and then in the upper layers there is the network protection. This is where Towersec comes into play with its proven and leading technology, providing the vehicle network. For the outside communications we have Redbend, which is the expert in OTA update technology.

As we know from our PCs at home, it is vital to update security software continually – perhaps every day – to counter new threats. We are not quite there with our cars, but it is vital for cars of the future that we offer security updates. So here, again, we have the market leader in Red Bend. Its technology protects billions of OTA software updates in thousands of products, not just cars, but in devices such as smart home door locks, the Samsung Gear watch and many others.

So, with the two companies – Towersec and Red Bend, we complete our 5+1 security suite portfolio.

**VH: With the increasing (and likely exponential) growth in OTA upgrades, is it possible to guarantee security, and not provide a wide-open door allowing access to vehicle systems to all and sundry?**

**HR:** Here at Harman, and I am sure the same is true at every OEM, every Tier 1, we do everything we can to make sure that an OTA connection cannot be hacked. However, just as with PC anti-virus software, we can't say that we guarantee that you can't be hacked – that's just not possible – but we can say that at any given point in time, or day, we are doing everything that can be done. OTA is not a wide open door, but it is an area that will demand continual work to maintain protection.

**VH: How will Harman (and the industry) address the challenge of slow CAN buses? Aren't we facing issues whereby OTA upgrades will take excessive amounts of time to deploy over the network? What happens if a car is started and driven off while an upgrade is underway?**

**HR:** We have a couple of technologies that are applied. The first of these we call Smart Delta. When an update is available, requested or necessary, only the Delta image is being sent down to the system. For example, the largest ECUs in the car are the head units, where you have perhaps 5GB of code in there. You can imagine that updating 5GB over the air is impossible. Smart Delta calculates what you actually need to update and download, typically 5% of the full 5GB. This is much more manageable. Bear in mind this is not new



or untried – the same technology is in use in millions of cellphones. So that is the first way we handle this.

Then, in the car itself we have an update client that manages the update process. First it checks whether the car is in a good position for the update – is it stationary with the ignition off? Is there sufficient memory? Is the car battery in good condition? It then monitors the update process happening, providing a route back if there are interruptions. The download can be interrupted if the car is driven away, or for any number of other reasons, but that is not a problem. The download stream can continue later. Only when the download has been completed, the car is in a viable state for the update to take place and the update is completed will it re-flash and re-boot the system and activate it. Everything is under control. While it is possible for a map update to happen while a car is being driven – BMW is already doing this, and can manage the system whereby the car is shut down while the map update is happening - systems updates cannot happen under those circumstances. If you start up and drive away while a systems update is happening, we have that covered.

**VH: Linked to above, and the process of regularly downloading large files for updates, is there a need for a new vehicle bus architecture?**

**HR:** No. Remember that Smart Bus keeps the update files small, and that it is very unlikely that you would be trying to update all the ECUs or all of the car in one go. Typically, the central gateway can reach all of the ECUs, so it represents one of the central update servers. So no, we do not consider that for now there is a need for a new vehicle bus architecture. In the future there may be a need for a new architecture to cope with the increasing amount of computing power in the car, and the increase in data flow inside the car, but this need will not be driven by OTA upgrades.

**VH: Will the threat of hacking and security breaches slow implementation of connected car technology, or will systems be pushed into the market regardless, with a 'fingers crossed' attitude?**

**HR:** Security technology development may, possibly, slow some aspects of development a little, but really not the overall development of connected car technologies. But for sure there is not a fingers crossed attitude. Not from our side, and we do not see it from our customers. More and more people are working on security today.

**VH: Can the car industry be trusted to manage security, or does it at least need to be standardised, or perhaps even regulated?**

**HR:** I think you cannot standardise this. Standardisation is a very slow process – look at standardisation for safety, for example. I can't see that at the speed we are working today a standardisation process or that regulation could help. It just couldn't keep pace. If regulation is enforced from government level, then test processes would have to be agreed that could be updated very fast, not every few years as we have with other forms of regulation. Cyber security is an incredibly fast-moving ecosystem.

Overall, Harman is very comfortable with the solutions we have today to keep the car and driver safe and secure, and this gets more and more important as we move towards autonomous driving, where new attack vectors will have to be considered. This will be an ongoing and never-ending evolution process.

<http://www.harman.com/security>



# MIRROR, MIRROR, ON THE WALL...

## Whose smartphone system is best of all?

Will Apple CarPlay, Android Auto and MirrorLink, solutions continue to connect the car to the cloud?

**A**UTOMOTIVE OEMS ARE SPLIT IN THEIR SUPPORT FOR THE VARIOUS WAYS OF DELIVERING SMARTPHONE CONTENT TO THE VEHICLE DASHBOARD. FOR THE TIME BEING AT LEAST, CAR COMPANIES REALISE THAT THEIR CUSTOMERS WANT TO BE ABLE TO ACCESS CONTENT THAT IS ON THEIR SMARTPHONE OR OTHER MOBILE DEVICE (I.E. TABLETS, PREDOMINANTLY) ON THE IN VEHICLE INFOTAINMENT (IVI) SYSTEM IN THE CAR. THIS MAY BE IN ORDER TO PLAY MUSIC FROM SPOTIFY, TO USE A NAVIGATION SYSTEM, OR TO FIND SOMEWHERE TO PARK. AT THE SAME TIME, CONSUMERS ARE BECOMING AWARE OF THE NEED FOR THEIR CAR TO BE CONNECTED TO THE CLOUD.

On the surface, the primary platforms that the OEMs need to support are Apple and Google. Those two do, after all, cover the vast majority of mobile devices in use today. But it is not a two-horse race. For some time now MirrorLink, backed by the Car Connectivity Consortium which claims support from 56 car manufacturers, has been a contender, while some manufacturers have decided to develop

solutions as promoted by the Genivi Alliance. Ford and Jaguar Land Rover are perhaps the biggest and most influential OEMs to have adopted this approach, and Ford's SmartDeviceLink, has now been publicly adopted by Toyota, with PSA, Honda, Mazda, Subaru and also software supplier QNX Software Systems lining up to follow.

So several solutions – Apple CarPlay, Android Auto, MirrorLink, proprietary. The table accompanying this feature provides an overview of which manufacturers support which system. We will continue to include MirrorLink, but if I am honest, its future does not seem as bright as the other contenders, which are currently attracting most of the attention.

Oh, and don't shoot the messenger if there are discrepancies in this list. Support levels seem to change continually, and the listings by the platform providers regarding who supports what seem to be somewhat 'fluid', to put it diplomatically. If you feel you can help us improve the accuracy of this listing, feel free to get in touch. We're going to try to keep it up to date.

Or, will we not need to?

## WHERE'S THE CRYSTAL BALL?

While the need to inform and entertain a car's occupants will no doubt continue – grow, even, as we move towards autonomous driving – the jury seems to be out on the matter of whether the mobile device will continue to be the delivery platform.

We all know that smartphones and tablets, while launched onto the market as communication devices, have in fact evolved into a) advertising delivery platforms and b) data gatherers. While Apple is, possibly, mildly discrete about this, Google is more blatant, and Amazon's Android-based Kindle Fire series tablets are 100%, in-your-face shopping devices – albeit based on a good tablet that has done its bit to try to bring some sensible pricing to the tablet market.

Both Apple and Google have recognised that the car is not only a perfect extension of the mobile shopping mall viewing experience, but it is also capturing vast amounts of user data, and on a continuous basis. Little surprise then that both companies have delivered ways of crow-barring their OS's into the car. Without doubt, both would surely want to become a fully-embedded component of a car's infrastructure. Indeed, Google is already working on an embedded version of Android. CarPlay and Android Auto are widely supported by the major car companies, with almost half supporting both platforms.

While consumers continue to carry smart, connected mobile devices around with them (and obviously, this is a scenario with a high level of probability), it is, then, surely a slamdunk for Apple and Google, isn't it? Their talons are gripping firmly, aren't they? Well, perhaps not.

## THE BATTLE FOR CONTROL AND OWNERSHIP

There are reasons why the OEMs might like to operate a different model, and not hand over this opportunity to the smartphone manufacturers. The first reason is control. It is probably fair to say that the car companies are already reeling at having to adjust their development timescales to try to match those of the mobile device industry. When this is coupled with having to work within boundaries set out by the consumer electronics (CE) device companies, this means that the OEMs are not only working at breakneck speed, but they are suddenly losing the autonomy and control they have enjoyed until now.

There is another complication, this time a practical one. That is that CarPlay and Android Auto are designed to present themselves on one screen in a car. Today's premium IVI systems regularly have two displays, and in some cases three. This is likely to proliferate. Today, the smartphone platforms can't cope.

But the problems run deeper. As Peter Steiner and Marcus Keith of Audi observe elsewhere in this issue, providing access to connected services via Apple CarPlay or Android Auto severely limits the car company's ability to customise applications and services, and to differentiate their company from their competitors.

Smartphone apps also deliver a 'thin' solution to the customer. What does this mean? Well, no matter how shiny and trendy a smartphone app may be, and this includes smartphone-based navigation, it is not connected to the advanced systems in today's cars. Navigation systems developed by the OEMs utilise external GPS antennas and can access vehicle sensors for dead reckoning when GPS signals are not available, and can send instructions to the lighting, braking and drive-train systems within the car to deliver a better, safer and more efficient driving experience. Handing over navigation responsibility to a smartphone app negates hundreds of millions of pounds/dollars/euros-worth of car company investment. This is not going to sit comfortably with the OEMs, and to quote from our interview with Audi "At this time the nav system demarcates the border line of a conflict between strong players including Google and Apple as it is decided how to get the nav system connected to the car." Quite understandably, the car companies have little interest in developing their cars as a platform for the smartphone companies, a situation that, if extrapolated to the -nth degree, would

leave the car a somewhat empty shell when not connected to the smartphone. Amongst a number of reasons, this is one of the realities that causes car companies to believe that relying on smartphones is not the way forward.

## COMMERCIAL MANOEUVRING

I sense that many of the dealings between car companies and Google/Apple have been done through grifted teeth. It would appear that Google is a little easier to deal with, and that Apple has been demonstrating the same concern for personal data in its dealings with the car companies as it has with everyone from the FBI to the families of deceased Apple device owners who have tried to unlock their recently-departed's iPad or iPhone.

## CUTTING THE TIES

It would be nice, then, wouldn't it to be able to step outside of Apple's walled garden and Google's colourful bazaar? Perhaps Ford and JLR are taking the right road by opting for solutions outside the consumer electronics dictate? That opens up the OEM to a world of application developers, and side-steps the need to get in bed with Apple or Google. While dedicated solutions from the car companies may well prove to be the long-term choice of more car companies who can then each build their own app stores, there are challenges to overcome. I've experienced the IVI systems in cars from Ford and Jaguar Land Rover. The first thing that strikes you is that the number of applications on offer is limited compared to those available from Apple and Google. The reason for this seems to be that each app is 'curated' by the OEM, and is often customised or tailored to fit each manufacturer's system. This will undoubtedly make the process of building app stores slower and more complicated than it could be. As Audi pointed out in our interview, this also brings into question whether these systems are truly open-source APIs. Audi used Spotify as an example, saying that when it first spoke to the music-streaming company, it was not interested in talking to Audi, because with each new automotive company Spotify had worked with to that point, Spotify had had to re-write source code and the API/interface. If an app developer still needs to change code inside his app to make it talk to the API provided by the OEM, is this really an open-source platform? Spotify and Audi subsequently partnered.

For these reasons, the OEMs I have spoken to quietly admit that they would prefer to develop their own IVI platforms. Indeed, many of them continue to do so alongside supporting Apple CarPlay, Android Auto and MirrorLink. In my experience, OEM systems offer more sophistication, look better, manage multiple displays, enjoy levels of integration with advanced systems in the car that smartphone apps can only dream of. What's more, they have access to complex and feature-rich, cloud-based back-office solutions that have been developed in big-company partnerships between the car companies and specialists such as Ericsson with its Connected Vehicle Cloud. This is compelling.

So, in my opinion, while the car companies will continue to provide support for the mobile device platforms, they probably want to move away from this in the longer term. Google may have a better chance than Apple of maintaining its relationship with the OEMs, courtesy of its second generation, embedded Android proposition, which builds upon software tech in the car. However, there is one remaining element that could, in fact, control the route forward.

## THE GOLDEN EGG

That element is data. To be precise, the use and commercialisation of data that is being generated and gathered by the car. This has massive potential and value. Every player, every car company, Google and Apple all know this.

The organisation with access to the data gathered by a car has access to the owner or driver's habits. Where they go, when, what their habits are, their driving style, musical preferences, and even - via the nav system - which coffee shops, DIY stores, restaurants and hotels they frequent and therefore prefer. This is incredibly

valuable data. It can be used by retailers to market products and services, by insurance companies to reward good driving and punish bad, by the OEM's service organisation to track and manage service schedules and, let's not forget, by authorities and regulators to track movements, levy road tolls, issue fines for driving misdemeanours or unpaid road-fund licences etc, etc. The possibilities are endless.

Basic privacy agreements cover the fact that this information belongs to the driver, but let us not for one moment believe that that basic tenant will stop the car companies, Google, Apple et al from trying to grab and commercialise the data.

This issue, ownership of data and who gets to use it is a major topic, and one that will be covered in its own, dedicated Connected Car feature. However, the data landgrab that is starting to happen right now is another process that is set to create a massive divide between the car companies, the CE companies, Google and Apple. The car companies have first and best access to the car's data, and talks we have had suggest that some will use this position as a negotiating tactic with Google and Apple. In the background, the OEMs are likely to be making sure that their cloud services platforms are in place and ready to go.

## MIRRORING SUCCESS

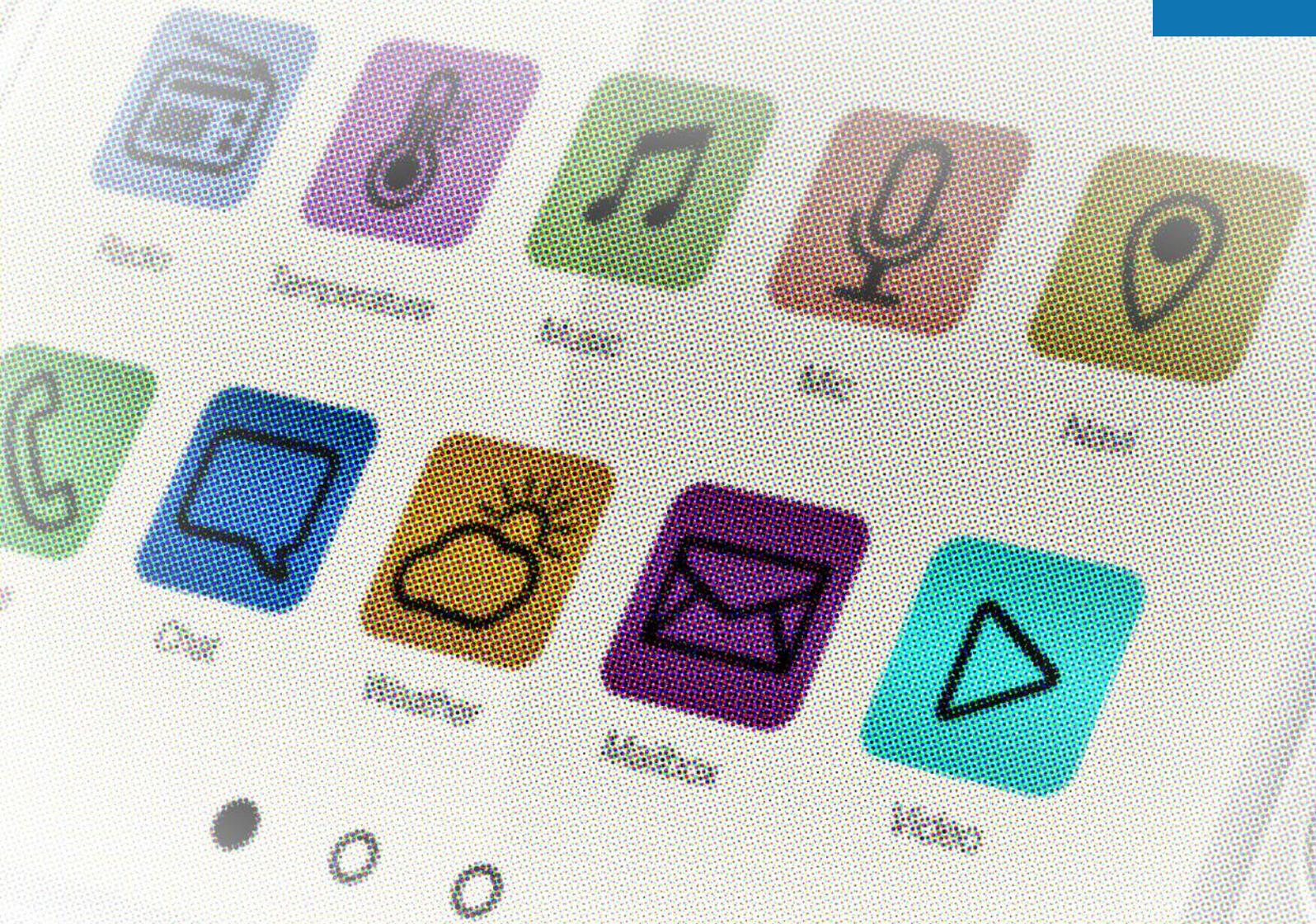
In my mind, this situation – the use of mobile devices to connect the car to the cloud – could go one of two ways. There could be a continuation of the somewhat uneasy relationship between the car companies and the smart device manufacturers, and with the car

companies and Apple and Google. If this happens, it will be because the car companies have negotiated commercial relationships which mean that the extra revenue they are looking to gather from non-hardware activities (i.e. money earned outside of selling cars) is coming through data and revenue-sharing deals that have been done with their partners on the other side of the fence.

I believe that this model will enjoy a half-life extending anywhere between 2-5 years, as it will not be possible for the car companies to put all systems in place to manage online services without the established support platforms provided by smart device manufacturers and the likes of Apple, Google, Amazon and so on.

But I also believe that this is a fundamentally uneasy alliance of convenience. The determinedly independent and in some ways proprietary nature of the major car companies will eventually see them cutting the mobile device loose, releasing them from any responsibility to support CarPlay, Android Auto, MirrorLink or any other platform. The lengthy history of auto-making has created an ecosystem that does not want to be forced to enter an alternate universe, to have to partner with non-automotive companies that have an intense desire to make money. The OEMs see that their (soon to be erstwhile?) partners recognise connected car as a major new revenue generator – and this is revenue that the car companies will not want to share.

Ultimately, it seems certain that the car will be the mobile communications device that links the consumer to the cloud, and to every financial opportunity out there in the big, wide, heterogeneous world.





# NEWS

## MOTOR INSURANCE INDUSTRY FACES RADICAL RESTRUCTURE DUE TO AUTONOMOUS CARS

The multi-billion pound motor insurance industry faces a period of radical restructuring as a result of the advent of autonomously driving cars, with the number of crashes set to drop by 80 per cent by 2035 and insurance premiums set to plummet, a high-level panel discussion organised by Volvo Cars and Thatcham Research heard during May.

Research by Swiss Re and HERE released last month calculated that autonomous drive (AD) technologies could wipe USD20bn off insurance premiums globally by 2020 alone. At present, motor insurance generates 42 per cent of all non-life gross premiums, the largest single slice of global premiums.

Volvo Cars believes that the insurance industry will have no choice but to react to these seismic challenges to its existing business model.

“The medium-to-long-term impact on the insurance industry is likely to be significant. But let’s not forget the real reason for this – fewer accidents, fewer injuries, fewer fatalities. Autonomous drive technology is the single most important advance in automotive safety to be seen in recent years,” Hakan Samuelsson, president and chief executive of Volvo Cars, told a seminar held in London entitled ‘A Future with Autonomous Driving Cars – Implications for the Insurance Industry’.

Peter Shaw, chief executive at Thatcham Research, said: “Vehicle manufacturers are predicting that highly autonomous vehicles, capable of allowing the driver to drop ‘out of the loop’ for certain sections of their journey, will be available from around 2021. Without doubt, crash frequency will also dramatically reduce. We’ve already seen this with the adoption of Autonomous Emergency Braking (AEB) on many new cars.”

Volvo Cars says that it is fully committed to maximising the safety benefits of AD cars. It announced last week that it will start a UK AD trial, entitled Drive Me London, in 2017, with up to 100 AD cars being driven on real roads by real people, with similar programmes to be run in Sweden and China.

## PORSCHE GOES DIGITAL TOO

The headlong rush to turn car companies into Internet businesses continues at a furious pace. Now it is Porsche, which has formed a new company – Porsche Digital GmbH – to act as its vanguard. Porsche says that the objective of the new enterprise is to ‘further develop Porsche into the leading provider of digital mobility solutions in the premium automotive segment’. Managing director of Porsche Digital GmbH will be Thilo Koslowski. He recently joined Porsche from the US IT consulting company Gartner Inc. Koslowski is considered an expert in the automotive as well as Internet and technology sectors. The newly founded company will have its head office in Ludwigsburg near Stuttgart. Further sites will be in Berlin, Silicon Valley and China.

Commenting on the announcement, Dr. Wolfgang Porsche, Supervisory Board chairman of Porsche AG said, “Our business environment is changing ever more dynamically. Porsche Digital GmbH will strengthen the brand, develop innovative customer experiences and attract new partners. We are combining the traditional Porsche spirit with the power of new technologies.” For Porsche CEO Oliver Blume the new subsidiary “is a logical step in order for Porsche to successfully position itself for the digital future.” Blume added that for Porsche, digitization has three dimensions: Product, customer and companies.

Porsche Digital GmbH apparently considers itself to be an interface

between Porsche and innovators around the world. This applies in particular to the areas of connectivity, smart mobility and autonomous vehicles. As part of Porsche’s digital transformation, the new subsidiary will promote long-term partnerships with suitable partners and in this way create a digital ecosystem. There are also plans for equity holdings in venture capital funds and start-ups which offer opportunities for close collaboration with innovative, high-growth companies, talents and new technologies.

# SHORT cuts

## VOLKSWAGEN GROUP ANNOUNCES A STRATEGIC PARTNERSHIP WITH TAXI PROVIDER GETT

In line with Connected Car’s observations about car companies looking to make money from none-car selling activity (see this month’s feature ‘Mirror, mirror on the wall’), the Volkswagen Group has made a USD 300 million stake in Gett. On the map with over 60 cities worldwide, Gett is in the same business as Uber and claims to be one of the fastest growing ride hailing providers in the mobility-on-demand area. The Volkswagen Group’s expressed goal is to generate a substantial share of sales revenue from such new business models by 2025. To this end, the Group is publicly stating that it is open for new partnerships and strategic investments.



# REVOLUTION IN THE AUTOMOTIVE INDUSTRY

## What does tomorrow's mobility ecosystem look like?

An interview with Porsche futurologist Lars Thomsen.

**CC:** Mr. Thomsen, will automobiles even exist in future?

**LT:** Yes, but several basic aspects related to automobiles and individual mobility will change fundamentally over the next ten years. This will particularly be the case with regard to drive systems and autonomous capability, or "intelligence". However, there will also be a change in the way we view the concept of individual urban mobility. In other words, we're on the verge of several upheavals.

**CC:** Some people are predicting that the significance of the automobile as a status symbol will decline rapidly.

**LT:** Most people still view their cars as a very important and also emotional part of their lives and their culture of mobility. However, more and more people in big cities, and especially young people, want to be able to use cars but don't necessarily want to own one. The mobile Internet allows them to choose the most efficient form of mobility for a given situation, which in many cases is not an automobile. In general, these people no longer view cars as status symbols but instead as one mobility option among many. This trend is growing in line with the increasing availability of car-sharing

services, and it will expand even further with the advent of fully automated urban vehicles in future.

**CC:** What will the car of tomorrow actually be like – in terms of drive system technology, for example?

**LT:** The combustion engine has been the dominant power source for cars and trucks for more than 100 years now, but like every other technology, it too will be replaced by something better at some point. Electric cars are much more dynamic, require less maintenance and consume fewer resources. Up until now, however, the lack of powerful and reasonably priced batteries has prevented electric vehicles from achieving a major breakthrough. Nevertheless, we will very soon reach the point where pure electric drives will be cheaper than combustion engines and hybrids. We will reach this point on a global scale before 2020 in fact. In around ten years, according to our calculations, we will rarely see vehicles equipped with combustion engines coming off the assembly lines anymore. However, this doesn't mean that such cars will lose their special appeal, especially since they'll then be viewed as classics. It's just that more and more cities will tighten restrictions on vehicles with

combustion engines – and the autonomous city pods we expect to see starting around 2022 will all be electric.

**CC: Why is this development so important?**

**LT:** It's already the case that our children no longer accept the way we use energy and finite resources, or how we deal with climate change. In ten years, it will be difficult for us to explain to them why we didn't act differently, given our level of knowledge and our moral codes, and especially given the fact that we already knew there were effective solutions available. In Germany, for example, we already generate nearly twice as much electricity from renewable sources as all passenger cars in the country would need if they all ran on electricity. We're talking here about energy we produce ourselves and energy that does not harm the global climate. Moreover, providing such power for electric cars would be four times less expensive than the imported fossil fuels we use today. The large-scale use of electric cars would also offer a partial solution to the problem we currently face in terms of a lack of storage media for energy from renewable sources. In addition, I would point out that the raw materials used for the batteries in electric vehicles do not pose any problem. For example, more than 98 per cent of the materials used in lithium-ion batteries are recyclable and non-toxic. Moreover, when you consider that a car with a combustion engine consumes more than 20,000 kilogrammes of non-recyclable fossil hydrocarbons throughout its service life, and thus produces around 70,000 kilogrammes of greenhouse gases, then the roughly 300 kilogrammes of material in a battery doesn't really amount to much of an issue.

**CC: Vehicle electrification isn't the only mobility megatrend that people are talking about at the moment...**

**LT:** No, as I indicated, there are currently a whole range of megatrends that are changing our world. Megacities around the world with millions of residents are desperately looking to develop new urban mobility concepts that are not necessarily compatible with the products that are available today. Digitisation will also bring us to the point where computers will be able to carry out an increasing number of routine activities (and driving will be one of them) more effectively and in a more error-free manner than is the case with humans. In just five years, a computer will be driving us around in our new cars in most driving situations – and we will find this to be very cool and relaxing. At the same time, we will be able to enjoy and celebrate the old-style driving experience with traditional cars in our free time.

**CC: Does this mean automakers will become IT companies?**

**LT:** Yes, and IT companies will become automakers. What we're hearing now is that Apple plans to launch a vehicle as early as 2019. Google and other companies are working on autonomous

vehicle systems that we might soon be able to use in major cities around the world. As a result, assistance systems and systems that connect vehicles with energy, traffic guidance and information networks will also become more and more important in the vehicle development process in future. The nature of expertise and value creation in the automotive industry will change and competition will become more intense. This will present tremendous challenges to the industry and related economic sectors.

**CC: Nevertheless, let's be honest: isn't all of this still a long way off?**

**LT:** A lot of things that appear normal to us today seemed like a dream of the future just ten years ago. Most developments follow a certain logic and are based on reliable data. Whenever there have been upheavals throughout history, you can always look back and retrace how it was that they came about. Our approach is to apply this principle to the future. Consider the following example: when you make popcorn, you heat up the corn kernels in a pot with hot oil (this is the trend) – and then nothing happens for a while. However, at a certain point the first kernel opens up because the water it contains turns to steam and this causes it to pop. The thing is that once this point is reached, nearly all the kernels pop within a few seconds. We refer to this as the tipping point, and it is relatively easy to calculate beforehand if you understand the basic principle. If you look at the technological transformations over the last 300 years, you'll see that this type of logic is involved in nearly every case.

**CC: Yes, but how can you know all of this – do you have a crystal ball in your office?**

**LT:** Yes, actually we do – but it's used more for decorative purposes. The work of a futurologist is based on a good mixture of curiosity, the meticulous collection of facts and data, the development of understandable and logical models of future developments and a great deal of travel in order to learn about the people and companies that are working to shape the future. This also makes the work of a futurologist very exciting. The future is not a coincidence; it is shaped and invented by people who come up with new things. Ultimately, it is then the consumers who decide whether a given innovation actually improves their lives. It's as simple as that.

# Connected Car

Connected Car is a free subscription publication.

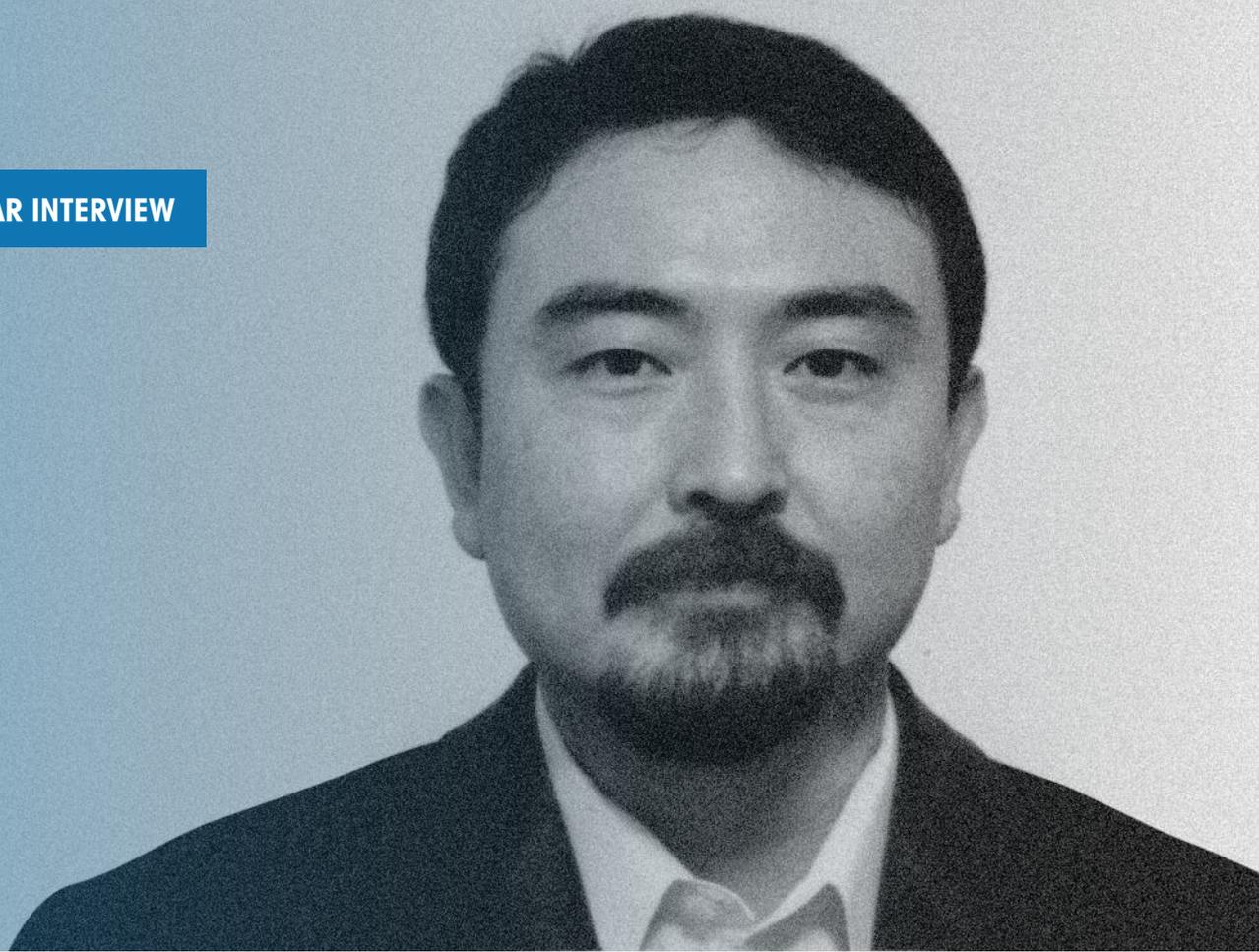
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In Connected Car magazine each quarter readers are able to access market-specific phone/smartphone data and detailed regional summaries from our sponsor NextGen Technology's global market research (see pages 34-36).



## NextGen



# TOYOTA PURSUES OPEN-SOURCE MODEL

Vince Holton talks with Kenichi Murata, Group Manager, Connected Strategy & Planning, Connected Company, Toyota Motor Corporation

**IN** THE PREVIOUS ISSUE OF CONNECTED CAR WE REPORTED THAT TOYOTA HAD PUBLICLY STATED ITS SUPPORT FOR FORD'S OPEN-SOURCE SMARTDEVICELINK SOFTWARE PLATFORM. FORD SYNC IS BUILT ON SMARTDEVICELINK. TOYOTA APPEARS TO BE TAKING CONNECTED CAR TECHNOLOGY VERY SERIOUSLY, AND DURING APRIL ALSO ANNOUNCED THAT IT WOULD COLLABORATE WITH MICROSOFT TO CONSOLIDATE MUCH OF THE AUTOMAKER'S GLOBAL RESEARCH IN TELEMATICS, DATA ANALYTICS AND NETWORK SECURITY SERVICES. CONNECTED CAR CONTACTED TOYOTA IN ORDER TO LEARN MORE, AND HAD THIS INTERESTING DIALOGUE WITH KENICHI MURATA.

**VH:** All car manufacturers are investing a great deal of time and effort in infotainment and connectivity systems. What is Toyota's end goal and what is your vision of the way the end user experience will evolve?

**KM:** Based on the coming IoT (Internet of Things) era, Toyota believes connected technology is an important factor so that customers can enjoy ever-better cars. We will continue to improve

vehicle hardware specifications of Data Communication Module (DCM) and globalize the system. Then we will provide more information to customers and introduce services using vehicle data (such as highly-accurate traffic information using probe data), which will globally enable a wide range of customers to enjoy car driving more safely and securely.

Also, Toyota believes customers' connected needs continue to increase. Bringing safe and secure connected technologies into the car helps us provide our customers with better services and enhanced safety features. It has allowed us to improve driving safety and environmental responsiveness like ITS-Connect by connecting cars with the infrastructure (V2I) and other cars (V2V) through communications. We recognize these technologies will increase driving enjoyment.

**VH:** Who is driving connected car development? Is it the car companies, the mobile device companies, Apple or Google, Tier 1 suppliers and application developers or network operators?

**KM:** I think it is the car companies. Of course, each car company is asking support from other players such as listed above.

**VH:** At this time, most car companies seem to be accepting that they need to provide support for Apple CarPlay and Android Auto. Will this continue?

**KM:** I think it depends on market demands.

**VH:** Toyota seems to have decided to take control by adopting the open-source Smart Device Link solution developed by Ford. Can you explain why this decision was made?

**KM:** The collaboration between Ford and Toyota was announced in August 2011, and we are confident that Toyota and Ford share the same view that as an automobile industry, we need to develop and spread a safe telematics system. Neither Ford nor Toyota will use SmartDeviceLink (SDL) exclusively.

Toyota agreed to collaborate in the development of required standards and technology for safe, secure, and convenient telematics services in August 2011. Ford and Toyota's common scope of consideration has been HMI and telematics standards. Both companies share a philosophy of prioritizing driving safety in regard to smartphone connectivity.

**VH:** Shigeki Terashi, executive vice president, Toyota Motor Corporation observed, "Developing a safer and more secure in-car smartphone connectivity service – which better matches individual vehicle features – is exactly the value and advantage an automaker can offer customers. We expect that many companies share our view and will participate in the industry SmartDeviceLink collaboration." Is it important to Toyota that SmartDeviceLink becomes a widely adopted platform, and what happens if it does not?

**KM:** If SDL becomes widely accepted in the market, there would be advantages from multiple points of view; 1. From a customers' point of view; they can use a standardized system and enjoy less expensive and familiar apps, 2. From an app developer point of view; they can expect more efficient app development and larger business scale, 3. From an automakers point of view; apps can be developed more efficiently and quickly; automakers can meet customers' needs more quickly by introducing safe and familiar apps.

As mentioned previously, Ford and Toyota will not use the SmartDeviceLink (SDL) exclusively. Both will try to expedite broader utilization of SDL in auto industry.

**VH:** Will Toyota become involved in curating/selecting apps to be used in its cars or will this be Ford's responsibility?

**KM:** Since SmartDeviceLink(SDL) is not exclusive but open project, everybody can create an application with the technology if they become SDL apps developer. Neither Toyota nor Ford has exclusive control of selecting applications in the project. There is, however, a framework that a car company can select applications for each type of in-vehicle system.

**VH:** Does Toyota believe that the Genivi Alliance has an important role to play in the open-source community?

**KM:** Since Toyota does not participate in the Genivi Alliance, we cannot tell how it is important. However, Toyota is a member of AGL: Automotive Grade Linux work group in the Linux Foundation and AGL is closely working together with Genivi Alliance for developing IVI: In-vehicle infotainment systems software.

**VH:** Will there continue to be a role for the user's smart connected mobile device (smartphone or tablet) in the car, and where should connected car processing take place? In the car? In the smartphone? Or in the cloud?

**KM:** It depends on types of applications. An application which is used even out of the customer's car should run on the customer's mobile device. On the other hand, an application which must run even though the customer's mobile device is not connected to the car should run in the car itself. With both of the cases, cloud should be a key role unless the application or the service does not need dynamic information.

**VH:** What are your thoughts and preferences on the next generation infotainment system operating systems? Is there one that stands out for speed, functionality, UI etc?

**KM:** Since it depends on various types of conditions and requirements of the system, I cannot tell the most important factor of the operating system. I believe that AGL: Automotive Grade Linux will implement such conditions and requirements.

**VH:** BMW, Audi and other manufacturers are already talking about the fact that they are evolving and becoming digital platform providers in order to bring revenue in from new areas. Will connected car technology be the tool that allows manufacturers, Google, Apple, Amazon etc. to turn the car into a digital revenue platform model?

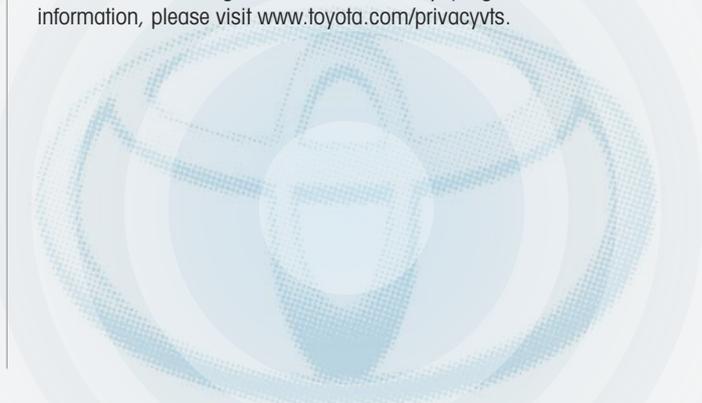
**KM:** I believe that connected car technologies will make customer's benefit. It is our first priority.

**VH:** Who 'owns' the data that is being gathered by a car, and who has the right to decide what is done with it? Is it the consumer who buys and drives the car, or is it the car company?

**KM:** These are defined as a law or a rule in each country. Toyota is absolutely aligning with these in each country.

**VH:** With much publicity recently about connected cars being hacked, how important is security, and who bears the main responsibility to provide it? How will Toyota ensure that its vehicles remain secure and free from sabotage?

**KM:** We take information security seriously. Toyota embraces "Privacy by Design" and considers the security and privacy of Personal Information and Vehicle Data at the very initial stages when creating our advanced technologies. We continuously strive to protect customers' Personal Information and Vehicle Data by employing our industry's best practices to resist security vulnerabilities through our formal security program. For more information, please visit [www.toyota.com/privacyvts](http://www.toyota.com/privacyvts).





# NEWS

## MWR RESEARCH HELPS WITH SECURITY ISSUES IN QNX BASED SYSTEMS

MWR InfoSecurity has detailed its research showing that, while a significant security effort has been put into hardening the BlackBerry platform, a number of QNX core components have not been subjected to as much scrutiny by the security research community.

Speaking about the implications of the research, Alex Plaskett, Head of Technical Research of MWR explained, "QNX Neutrino is one of the most widely adopted real-time operating systems (RTOS) powering safety- and mission-critical devices from across a large number of heavy industries. Neutrino lies at the heart of power and nuclear plants, air traffic control systems, turbine controllers and warehouse control systems. QNX is also known to run on at least 50% of today's cars infotainment systems which is the reason QNX was once described by TIME magazine as the 'tech company that is to connected cars what Microsoft is to PCs'. Many of these platforms are safety or security critical, therefore weaknesses in QNX can have a significant impact to these systems.

"For an OS that is touted as being safety critical it did not stand up well to an attacker intentionally providing malicious input. Whilst the operating system itself is designed to be highly robust and fault tolerant, mistakes which are often found on other \*NIX based platforms can be introduced into QNX too and together with QNX specific issues. QNX is certainly not vulnerability free and due to lack of information within the community about QNX security maintains a low profile."

The number of critical processes powered by QNX, and the limited amount of public research, drove MWR to take a closer look at how QNX is different from any other major operating systems. It has worked with BlackBerry to resolve the vulnerabilities.

## THE FAMILY SUV THAT NEVER FORGETS

The 2017 Land Rover Discovery Sport is claimed to be the car that never forgets thanks to the integration of Tile's advanced tracking app.

The app uses Tile tags, tiny Bluetooth trackers that can be attached to important items and used to track their whereabouts using smartphone technology.

With the average person reportedly spending 15 minutes a day searching for lost items, the in-vehicle app promises to put an end to this wasted time. Once the app is initiated using the central touchscreen, customers are alerted if specified items are not inside the vehicle and are even able to get on-screen directions to their last known location.

Peter Virk, Jaguar Land Rover's Director of Connected Technologies & Apps, told Connected Car, "Losing your wallet or leaving your child's sports kit behind isn't just an inconvenience. The realisation you've mislaid something important can be a cause of distraction. Our unique partnership with Tile means customers can check the status of tagged items using Discovery Sport's touchscreen, so forgotten items will be a thing of the past."

Jaguar Land Rover is apparently the first automotive company to integrate Tile with its in-car entertainment system. The partnership allows customers to establish a list of 'Essentials' using the vehicle touchscreen, which are always checked when the app is initiated. If items are lost inside the vehicle, customers are able to sound a 90-decibel alarm on the Tile tag, to help locate them.

The Tile smartphone app is compatible with both Android and Apple platforms and the number of items that can be tracked is limitless.

## FICHTNER IT CONSULTING AND MSG GLOBAL SOLUTIONS SELECTED AS WINNERS OF HERE AND SAP'S INTERNET OF THINGS APP CHALLENGE

HERE tells us that Fichtner IT Consulting and msg global solutions have won the joint Internet of Things (IoT) app challenge from HERE and SAP. They were announced as winners onstage at the SAPPHIRE NOW event, which took place in Orlando during May.

In November last year, HERE and SAP asked businesses and developers to create solutions with game-changing use cases for the IoT, leveraging SAP HANA Cloud Platform and the HERE cloud location capabilities. The winners were:

**Fichtner BGI Grid Analytics:** a solution to support asset management-related issues in the transmission and distribution grid. It geo-visualizes all relevant information required for asset management and grid planning and enables a thorough and complete analysis, minimizing downtime of assets and optimizing maintenance efforts..

**IoT Analyzer (IoTA) from msg:** software that gives insurance companies the tools to collect, monitor, analyse, model and report data from connected devices.

Eric Fumat, Vice President Enterprise Sales at HERE told Connected Car, "Fichtner IT Consulting and msg global solutions truly deserved to win our joint IoT app challenge with HERE and SAP. Their solutions deliver superior customer value and demonstrate the potential of the internet of things for new services and business models across industries. Congratulations!"



# BMW UPS THE ANTE WITH CONNECTEDDRIVE SERVICES

BMW has been extending its ConnectedDrive Online Entertainment offer and has also improved connectivity and flexibility through a variety of new features. The list of updates, improvements and changes is lengthy, so take a deep breath and read on.

**IN ADDITION TO THE MUSIC SERVICE NAPSTER, BMW CUSTOMERS CAN NOW TAKE ADVANTAGE OF USING THE ON-DEMAND AUDIO AND MUSIC STREAMING SERVICE, DEEZER IN THEIR CARS. CUSTOMERS CAN ENJOY DIRECT ACCESS VIA BMW ONLINE ENTERTAINMENT TO MUSIC AND SPOKEN CONTENT FROM THEIR VEHICLE, EVEN WITHOUT A SMARTPHONE. UNLIKE OTHER MUSIC STREAMING SERVICES WHICH REQUIRE THE USE OF A SEPARATE MOBILE DEVICE, THERE IS NO LIMIT ON EITHER THE NUMBER OF TRACKS SELECTED OR DOWNLOAD LIMITS AND DATA CHARGES.**

The service uses the on-board vehicle SIM to stream music thus avoiding any additional data charges for the customer. Subscription, says BMW, has never been easier, as customers can simply sign-up to Online Entertainment via BMW ConnectedDrive or alternatively log on with their existing Deezer or Napster account.

Online Entertainment with either Deezer or Napster is available for £160 a year. New customers can trial the service for the first month for just £1 when they join through the ConnectedDrive Store or using the BMW iDrive menu.

BMW has also launched a platform known as BMW Labs. This allows customers the first opportunity to test developing and near-

final products prior to full release. BMW says it will gain valuable data on how the services are being used in the real world, resulting in the ability to launch products to market at a faster rate.



BMW's most recent development uses the service IFTTT (If This Then That). Users can create simple conditional statements, which allows them to automate everything from their favourite apps and websites to app-enabled accessories and smart devices.

Meanwhile, BMW Online is a service now standard across the BMW range allowing the driver to keep up-to-speed with services such as the news and weather, to make use of the online search and office functions and to download apps within their car. Now by using the text-to-speech function, customers can have the news stories read aloud whilst driving and can find popular points of interest using Online Search to find the addresses of restaurants and tourist attractions. Customers can also take advantage of BMW Online Office to access one or more email accounts from their vehicle.

BMW's Remote App is available free of charge with BMW Professional Navigation and can be downloaded from the Apple store or the Google Play store. It enables users to operate all manner of functions in their BMW from outside the vehicle. This includes,

"Vehicle Finder" function, preconditioning of the vehicle, flashing the headlights in order to find their vehicle or remotely locking the vehicles doors from their smartphone. The app also allows owners to conduct an Online Search and by using 'Send to car' function the driver can enter a destination and send it to the car from their mobile device and have it available in the vehicle's iDrive for when they are ready to leave.

And to make this tech more accessible, BMW ConnectedDrive now offers a host of services, such as Concierge Services, Real Time Traffic Information and Internet on a monthly basis. These services amongst others can be added and the existing subscriptions renewed on a subscription length to suit each BMW owner, for example Real Time Traffic Information is available for £10 for a single month basis or £50 for the year.

# SHORT cuts

## MOBILEYE AND STMICROELECTRONICS TARGET SENSOR FUSION CENTRAL COMPUTER FOR AUTONOMOUS VEHICLES

Mobileye and STMicroelectronics have announced that the two companies are co-developing the next (5th) generation of Mobileye's SoC, the EyeQ5, to act as the central computer performing sensor fusion for Fully Autonomous Driving (FAD) vehicles starting in 2020. To meet power consumption and performance targets, the EyeQ5 will be designed in advanced 10nm or below FinFET technology node and will feature eight multithreaded CPU cores coupled with eighteen cores of Mobileye's vision processors. Taken together, these enhancements are claimed to increase performance 8x times over the current 4th generation EyeQ4. The EyeQ5 will produce more than 12 Tera operations per second, while keeping power consumption below 5W, to maintain passive. Engineering samples of EyeQ5 are expected to be available by first half of 2018.

## BENTLEY'S NEW BENTAYGA APPLE WATCH APP

Bentley Bentayga passengers can now control a selection of in-car systems from their Apple Watch, thanks to a new app developed by the British

luxury brand. The technology enables those being driven in the Bentayga to remotely control the on-board climate and entertainment systems; adjust the heating, ventilation and massage functions of their seats; and monitor real-time information, such as vehicle speed, distance travelled and outside temperature. Using the Bentayga's Bluetooth connectivity, Apple Watch wearers synchronise with the vehicle's Touch Screen Remote (TSR) system and then interact with the car from the convenience of their wrist.

## SILVERSTONE TECHNOLOGY CLUSTER OPENS FOR BUSINESS

A cluster of high-tech engineering businesses, the Silverstone Technology Cluster, has been identified in the area surrounding Silverstone Park by a new research report. The Cluster, which is being backed by the UK Government, highlights a market of untapped potential. Although world-famous for its motorsport capabilities, the area around Silverstone has evolved significantly. Over 4,000 small and mid-sized businesses have been identified within two hours of Silverstone specialising in aeronautics, automotive, medical industries, green energy, marine, defence, electronics and sensors, as well as motorsports.



## AUTOMOTIVE INDUSTRY EVENTS

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.

### 2016

28 June - 1 July 2016

#### **Connected Cars conference**

Olympia Grand, London, UK  
<http://connectedcarsworld.com/about/>

13-14 July 2016

#### **Automotive Linux Summit**

Tokyo, Japan  
<http://events.linuxfoundation.org/events/automotive-linux-summit>

22-24 July

#### **Jaguar Land Rover Developer Challenge**

Coventry Transport Museum, Coventry, UK  
[www.jlrdevchallenge.com](http://www.jlrdevchallenge.com)  
Contact: [devchall@jaguarlandrover.com](mailto:devchall@jaguarlandrover.com)

23-25 August 2016

#### **Bluetooth Automotive Test Event 2016**

Auburn Hills, MI, USA

18-21 October 2016

#### **Genivi 15th All Member Meeting**

Burlingham, California, USA

### 2017

5-8 January 2017

#### **2017 Consumer Electronics Show**

Las Vegas, Nevada, USA  
<https://www.cesweb.org/about-us>

9-19 March 2017

#### **Geneva International Motor Show**

Geneva, Switzerland  
<http://www.salon-auto.ch/en/news/>

9-12 May 2017

#### **Genivi 16th Member Meeting**

Hilton Metropole Hotel, Birmingham, UK  
[www.genivi.org](http://www.genivi.org)



# NextGen

## TOP HANDSET RELEASES BY REGION – Q2 2016



### EUROPE

MANUFACTURER	MODEL	RELEASE DATE
Apple	iPhone SE	Mar-16
Huawei	P9	Apr-16
LG	G5 H850z	Apr-16
LG	K10 K420n	Jan-16
Microsoft	Lumia 650	Feb-16
Samsung	Galaxy A3 (2016) A310F	Dec-15
Samsung	Galaxy A5 (2016) A510F	Dec-15
Samsung	Galaxy S7 Edge G935F	Mar-16
Samsung	Galaxy S7 G930F	Mar-16
Sony	Xperia M5 E5603	Sep-15



### NORTH AMERICA

MANUFACTURER	MODEL	CARRIER
Apple	iPhone SE	AT&T
Apple	iPhone SE	Verizon
LG	G5 H820	AT&T
LG	G5 VS987T	Verizon
LG	K7 K330	T-Mobile
LG	Optimus Zone 3 VS425PP	Verizon
Samsung	Galaxy S7 Edge G935A	AT&T
Samsung	Galaxy S7 Edge G935V	Verizon
Samsung	Galaxy S7 G930A	AT&T
Samsung	Galaxy S7 G930V	Verizon



Apple iPhone SE



HTC One X9



Huawei P9



LeTV 乐Max X900+



Meizu Pro 6



Oppo R9 Plus



Samsung Galaxy S7 Edge G9350



Samsung Galaxy S7 G9300



Xiaomi Mi 5



Xiaomi 红米3



## CHINA

MANUFACTURER	MODEL
Apple	iPhone SE
HTC	One X9
Huawei	P9
LeTV	乐Max X900+
Meizu	Pro 6
Oppo	R9 Plus
Samsung	Galaxy S7 Edge G9350
Samsung	Galaxy S7 G9300
Xiaomi	Mi 5
Xiaomi	红米3

au Apple iPhone SE



au Kyocera Qua Phone KYV37



au Samsung Galaxy A8 SCV32



au Sharp Aquos Serie Mini SHV33



docomo Apple iPhone SE



docomo Fujitsu Arrows NX F-02H



docomo Sharp Aquos Compact SH-02H



docomo Sony Xperia Z5 Premium SO-03H



Softbank Apple iPhone SE



Softbank Sharp Aquos Xx2 502SH



## JAPAN

NETWORK	MANUFACTURER	MODEL
au	Apple	iPhone SE
au	Kyocera	Qua Phone KYV37
au	Samsung	Galaxy A8 SCV32
au	Sharp	Aquos Serie Mini SHV33
docomo	Apple	iPhone SE
docomo	Fujitsu	Arrows NX F-02H
docomo	Sharp	Aquos Compact SH-02H
docomo	Sony	Xperia Z5 Premium SO-03H
Softbank	Apple	iPhone SE
Softbank	Sharp	Aquos Xx2 502SH

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