IS CONNECTED CAR IMPORTANT TO THE GLOBAL NETWORK OPERATOR?
Connected Car talks to Matt Key, Commercial Director, Vodafone M2M

NEW VOLVO PLATFORM DELIVERS CONNECTED CAR EXPERIENCE
Vince Holton talks to Volvo’s connected car team

CONNECTING PEOPLE AND THINGS SINCE 1876!
An interview with Konstantin Zervas, Director of Business Development at Ericsson

FCA RESPONDS TO HACK ATTACK
Pan-industry realisation that security has to come first

BLUETOOTH AUDIO FRAGMENTATION IN AUTOMOTIVE ENVIRONMENTS
NextGen discusses audio fragmentation and how it manifests in the vehicle
Hello, and welcome to the third issue of Connected Car magazine. In recent weeks the automotive sector has been over-shadowed by news of Volkswagen’s attempts to rig vehicle emission data recording. There is no question that this story will run and run, and that there will almost certainly be wider-reaching implications than we realise today. While emissions are not part of Connected Car’s remit, we are very interested indeed in the way that car manufacturers capture, manage and share the data that is being generated by their cars. Taking things to the next level, we are also concerned with the way that unscrupulous hackers may be trying to access that data, and their attempts to gain access to vehicle control systems.

In this area, the most visible manufacturer is Fiat Chrysler Automobiles (FCA), which, as most of the automotive and tech world knows, has been the subject of an orchestrated hack attack. Two ambitious security pro’s decided to publicly demonstrate the vulnerability of current spec Jeep Cherokee SUVs by infiltrating the car’s control systems via the (Harman) infotainment system.

FCA responded with due briskness, but the implication of the two “culprits” seems to be that they were merely making visible the tip of an iceberg. There are doubtless other examples of vulnerability across the auto industry.

In this issue of Connected Car I took a look at how security issues in the automotive sector mirror, or at least follow in the footsteps of, similar experiences in the computing sector. Today, we don’t think about how poorly served consumers and businesses were by the leading tech companies - just a few years ago - when it came to protecting our data and our systems. Can the car industry learn lessons from the Information, Communications and Technology (ICT) sector? Yes, it probably can. And it needs to do so very quickly, and to take security very seriously.

Meanwhile, NextGen looks at audio fragmentation, and how it manifests itself in the vehicle and with peripheral devices connected to the mobile device when streaming audio, and updates the Top Handset Releases by Region data that is included in every issue.

Elsewhere in this issue we have great interviews with Ericsson, Volvo and Vodafone, and with the help of BMW and Volvo we have new Connected Car video productions to keep you informed and entertained. We will continue to grow our video archive over the coming months.
FEATURES

6 Interviewing Volvo’s connected car team plus new XC90 connectivity video feature

11 Automotive IoT: Connected Car talks to Matt Key, Commercial Director, Vodafone M2M

15 FCA is centre-stage as vehicle hacking hits the headlines, but are there lessons to be learned from the computer sector?

19 Automotive Bluetooth issues: Bluetooth audio fragmentation

23 An interview with Konstantin Zervas, Director of Business Development, Ericsson

SHOWCASE

14 Connected car video review

SUBSCRIBE

25 Subscribe free of charge to Connected Car magazine

INDUSTRY DATA

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

EVENTS

31 A round-up of significant connected car events happening around the world.
INTEL REVIEWS AUTOMOTIVE CYBERSECURITY BEST PRACTICES

With a view to mitigating cybersecurity risks associated with connected automobiles while encouraging technological progression and innovation, Intel has announced the establishment of an Automotive Security Review Board (ASRB). The board will apparently encompass top security industry talent across the globe with particular areas of expertise in cyber-physical systems. The ASRB researchers will perform ongoing security tests and audits intended to codify best practices and design recommendations for advanced cybersecurity solutions and products to benefit the automobile industry and drivers. Intel also published the first version of its automotive cybersecurity best practices white paper, which the company will continue to update based on ASRB findings.

Chris Young, senior vice president and general manager of Intel Security told Connected Car, “We can, and must, raise the bar against cyberattacks in automobiles. With the help of the ASRB, Intel can establish security best practices and encourage that cybersecurity is an essential ingredient in the design of every connected car. Few things are more personal than our safety while on the road, making the ASRB the right idea at the right time.”

Intel will provide the ASRB with its automotive development platforms on which to conduct research. Findings will then be published publicly as part of an ongoing process. To motivate the ASRB researchers, Intel will award a new car to the member who provides the most significant and impactful cybersecurity contribution that can be implemented on Intel’s automotive platform.

See also ‘FCA responds to hack attack’ on p15.

ERICSSON CONNECTED VEHICLE CLOUD WINS 2015 LTE AWARD

Ericsson’s Connected Vehicle Cloud was recognized for a 2015 LTE Award at the recent LTE World Summit in Amsterdam. Winning in the category of Most Innovative LTE Application, Connected Vehicle Cloud was highlighted for achieving innovation in the global LTE industry.

Ericsson suggests that mobile broadband is changing how consumers interact with the world around them. Powered by the cloud, the connected car promises to extend this interactive dynamic to drivers and passengers on the road. Ericsson is forecasting that Connected Vehicle Cloud will deliver a significant opportunity for stakeholders in the automotive ecosystem to reach drivers and passengers in new ways.

Konstantin Zervas, Director Business Development, IoT Solutions, Ericsson, and interviewed by Connected Car elsewhere in this issue said: “The rapidly evolving Networked Society encompasses billions of connected people and devices in an increasingly mobile world, with cloud-based access to everything. The connected vehicle is the newest frontier for the networked society that is emerging from this confluence of mobility, broadband and the cloud.”

Ericsson’s position is that Connected Vehicle Cloud builds on today’s telecom network capabilities and is intended to deliver improved quality of experience, creating new business opportunities for the automotive ecosystem and new M2M revenue streams for operators. The company claims that it is the most complete Connected Car platform in the global automotive industry, connecting vehicles and their occupants with automotive manufacturers, dealers, traffic authorities, network operators, repair shops, support centres, app developers, content providers, media agencies and other types of business.

See Connected Car interview with Ericsson’s Konstantin Zervas on p23.

BOSCH JOINS KO-HAF RESEARCH INITIATIVE

Bosch has joined forces with a number of other suppliers, automakers, and public-sector partners to launch the “cooperative highly automated driving” (Ko-HAF) research initiative, which aims to push forward the development of automated driving. The publicly funded project will tackle the challenges of highly-automated driving, in which drivers no longer need to be constantly vigilant. But for this to happen, technical precautions are necessary. Dr. Dieter Rödder, head of the future mobility systems unit at Bosch’s corporate research and advance engineering told Connected Car, “Highly automated vehicles rely on information about their surroundings – information which supplements the data collected by their own sensors.” Within the framework of the Ko-HAF project, Bosch has assumed primary responsibility for developing a backend solution for collecting and making available such information.

The backend solution is based on vehicles communicating wirelessly with a central server. For the duration of the project, a variety of vehicles belonging to the different project partners will collect the data. Along with information on objects in the road, this also includes data on the existence and quality of lane markings. An expanded digital map will then be made available for the vehicles to download. This will enable them to be informed in plenty of time about traffic hazards behind a bend or just over the crest of a hill.

In a separate announcement, Connected Car learned that international automotive supplier Continental is taking on the coordination efforts of the Ko-HAF research project.
GERMAN CAR MAKERS BUY MAP SERVICE FROM NOKIA

Audi, BMW and Daimler have agreed with Nokia Corporation that they will acquire its mapping and location services business HERE. The acquisition is intended to secure the long-term availability of HERE’s products and services as an open, independent and value creating platform for cloud-based maps and other mobility services accessible to all customers from the automotive industry and other sectors. The three partners will each hold an equal stake in HERE; none of them is seeking to acquire a majority interest.

A joint statement from the three companies said that HERE is laying the foundations for the next generation of mobility and location based services. For the automotive industry this is the basis for new assistance systems and ultimately fully autonomous driving. Extremely precise digital maps will be used in combination with real-time vehicle data in order to increase road safety and to facilitate innovative new products and services. On the basis of the shared raw data, the companies believe that all automobile manufacturers can offer their customers differentiated and brand-specific services.

The social benefits of what is being called ‘swarm intelligence’ are enormous: They facilitate warnings of hazards in real time, of icy roads for example, based on calculations of individual data such as ABS activations and outside temperature. Upcoming traffic jams will be identified more precisely in the future, significantly reducing the risk of accidents. In this way, the vision of accident-free driving is gradually becoming reality. In a further stage, the data could be used to learn about critical bends on the road, in order to warn drivers in good time or to activate assistance systems. Anticipation of green phases of stoplights could navigate vehicles through an urban area on a “green wave” with the appropriate engine performance and minimized fuel consumption.

High-precision maps are important for autonomous driving and many other forms of assistance systems, as these technologies require an up-to-date plan of a vehicle’s surroundings exact to the nearest centimetre, in order to react in real time. While HERE is said to already produce extremely precise static maps, they can be verified more exactly and continually updated with a constant flow of data from vehicles’ surroundings.

FCA US DEMOCRATISES ADVANCED DRIVER-ASSIST TECHNOLOGIES

FCA US is expanding the number of its vehicles that feature Full-Speed Forward Collision Warning-Plus as standard. This system combines radar and camera technologies – an innovation once reserved for luxury-brand vehicles, says FCA.

Full-Speed Forward Collision Warning-Plus doesn’t just detect potential frontal collision conditions. It detects, then confirms before activation occurs. Confirmation occurs when the two technologies – radar and camera – agree that an obstacle is present, and according to FCA, consistently outperforms those systems that employ singular solutions to object-detection.

When Full-Speed Forward Collision Warning-Plus activates, it pre-fills the vehicle’s brakes and transmits audible and visual warnings for the driver to intervene. No driver response triggers brief brake application as a tactile alert.

If the driver remains unresponsive and the frontal collision risk remains, braking occurs autonomously to slow the vehicle and reduce an impact’s severity. However, the system may bring the vehicle to a full stop if a frontal collision appears imminent at speeds below 25 miles per hour (mph).

LUXURY PHONES FOR LUXURY CARS

The second mobile handset developed by Vertu for Bentley made its debut at this year’s Goodwood Festival of Speed. Vertu was formerly a division of Nokia and claims to be the world’s leading manufacturer of luxury mobile phones. Part of the five-year partnership between Bentley and Vertu, the new Vertu Signature for Bentley has been on display at a number of key seasonal events this summer, including the Pebble Beach Concours d’Elegance in August. It was officially launched on September 18.

Since its first appearance in 2002, Vertu claims that the voice-centric Signature mobile has become a luxury icon in its own right. Although, with its simple choice of ‘call’ or ‘text’, Signature may not be the first choice for a car driver wanting to use his phone as a connectivity device, Vertu claims that the Signature maintains its appeal alongside the company’s contemporary smartphones.

Signature for Bentley ownership includes one year’s complimentary access to Vertu Concierge offered by a dedicated Lifestyle manager, providing what Vertu describes as ‘expert assistance designed to meet your every need’, 24 hours a day. Vertu Concierge is accessed via the dedicated Vertu Key – a ruby button on the side of the handset and is accessible via voice or email from anywhere in the world.

Vertu Signature for Bentley is available for order now.
NEW VOLVO PLATFORM DELIVERS CONNECTED CAR EXPERIENCE

Vince Holton talks to Volvo’s connected car team.

VOLVO CARS CONTRIBUTORS:
Joakim Alfredsson, Senior Manager, R&D Infotainment & Connectivity, Electrical & Electronics Systems Engineering
David Holecek, Director, Connected Products and Services, MSS
Sascha Heiniger, Communication Manager Connected Car, Corporate Communications
Johan Isaksson, Senior Manager Connected Car IT Development, Group IT
Fredrik Hulth, Manager, R&D Connectivity & Telephony, Electrical & Electronics Systems Engineering
Isac Antblad, Head of Connected Car, Group IT

ELSEWHERE IN THIS ISSUE, Connected Car magazine talked with Ericsson, the Swedish telecoms expert that is providing cloud services as part of a three-way partnership in the USA involving Volvo Cars, AT&T and, of course, Ericsson. This is a trailblazing initiative, and one which aligns with Volvo Cars’ apparent intent to grasp the connectivity nettle, and to set new standards of ease of use, convenience and quality user experience. Connected Car magazine decided to learn more from Volvo, and was able to talk directly with Volvo’s core team of connectivity experts. Volvo also kindly loaned us an example of its new luxury SUV, the XC90, and so this feature includes a video review of the car’s infotainment and connectivity system.

We started off by asking Volvo about the cooperation project in the USA. This was a multi-way, fast-moving conversation with your Connected Car writer outnumbered five to one, and with the Volvo guys all contributing to the dialogue as and when necessary. As a result it was hard to keep up with who was saying what, and so we hope that Volvo and our readers are OK with us handling the following feature as a ‘Connected Car talks to Volvo’ interview rather than identifying who made each statement!

CC: Why did Volvo get involved with AT&T and Ericsson in the US market?

VOLVO: We realised that the global automotive industry faces a big challenge with all of these new connectivity features, plus the building expectation from consumers that their cars will include connectivity features, just as their laptops, phones, tablets and other mobile devices do. This is creating a problem for all of the car companies as
we have very long, industrial-level lead times when it comes to designing and creating our cars. And, of course, cars have a much longer life than the average consumer electronics device.

We realised that we had to take a new approach, and couldn’t rely on things that were just built into the car itself. We needed a smarter, more modern way of approaching things, and this is when we wondered whether we could start to offload some of the functionality to somewhere else – somewhere outside the car – treating the car more as an interface to functionality that resides somewhere else. Perhaps, we thought, this would be on a server somewhere, or, even better, in the cloud environment. The goal was centred around global connectivity bringing new functionality to the customers more quickly, and keeping the car fresh and up to date long after it was originally specified and built. This concept would also allow us to enable different functionality in different markets and regions.

We couldn’t just offload all of the responsibility onto the customers to try to figure everything out, and at the same time we didn’t want to try to become a mobile network operator ourselves. We realised that we needed strong partnerships with network operators to make this work. AT&T was a natural fit for us in the US market as it had good coverage, a lot of experience in this area and also a willingness to embrace new concepts.

The process started some time ago. We started providing telematics solutions as far back as 2000, as the second car company to this market after GM with OnStar. And we were first OEM in 2010 to introduce an app allowing our customers to remotely connect with and control their car. We were also the first car company to provide connectivity across its entire range of cars, and across all markets. We did this in 2014. Our partnership with Ericsson started in 2013 with model-year 15 cars. Ericsson provides the global cloud platform and also adapts this to meet our regional needs. This is a long-term agreement, and covers not only the new cars we are launching now, but also the legacy cars that have been launched since Volvo became involved in providing connectivity. The three-way project including AT&T and Ericsson started with model-year 15 cars. Separate to the project with Ericsson, we also have another programme in place with AT&T based around connectivity.

**CC: On a day to day basis, how does the partnership with Ericsson work?**

**VOLVO:** We are using Ericsson as a service provider for the cloud solution. The infotainment & telematics systems in the car are connected to Ericsson’s Multiservice Delivery Platform (MSDP) cloud environment for the connectivity solution. We work with a different provider for the telematics part of the solution, in this case WirelessCar.

**CC:** OK, and how is Volvo handling software inside the car – both system level and apps? Is Ericsson involved with this at all, or are you perhaps working with someone like QNX?

**VOLVO:** No, we have a Tier 1 supplier that supplies us with the basic software and then we have done some in-house development at Volvo. Volvo-dedicated apps that we support through our design scheme use the Ericsson platform to communicate with the outside world. With the new Volvo XC90, we present these apps in the central display and in the instrument cluster in front of the driver. We work in four regions – Japan, China, Europe and the US - and have scheduled about 30 apps. At the moment we are supporting apps such as TuneIn, Pandora and Douban FM internet radio. Glymphse, local search of places such as gas stations, hotels, restaurants and more, and weather reports for all markets. We are also supporting Over the Air (OTA) upgrades to enable new functions on all cars in all markets.

**CC:** Do these OTA updates happen automatically, or does the customer have to opt-in?

**VOLVO:** We are asking the customers whether he wants to download the updates manually, or enable automatic updates. The customer controls all of this via software that Volvo has developed which is actually downloaded to the head unit in the car, rather than running in a browser window as other car companies have done. It’s like an app store, but without the payment element. This too will itself be updated, along with updates to things like the navigation software. We think it is very important that we have the best possible maps software in the car. Our customers can do these upgrades over the air if they like, or via a USB Flash drive if they want to use a faster connection outside of the car.

**CC:** Will all of this functionality become available across the entire range of Volvo cars?

**VOLVO:** We are looking at all of our cars, but there are and will continue to be slight differences in the set-up of some of the cars and their systems, and we also want to tailor the offering to the different cars. So, for example a high-end car like the XC90 SUV may feature different apps and features to some of our other cars. We will base this around regional differences and will use the demographics of the different customer groups. However, we do have a roadmap that sees us continually adding functionality to all Volvo cars.
**NEW VOLVO PLATFORM DELIVERS CONNECTED CAR EXPERIENCE**

**CC:** You’ve been majoring on Volvo developed and supported apps, but what is your position on people wanting to run additional third-party apps such as Spotify, for example?

**VOLVO:** We have a multi-layered approach. There are certain core apps that we want people to be able to use with the best possible level of integration and the best interface, and those are the things that we build into the car, using the cloud to distribute the code. This is where we do much of the development and integration in-house, alongside our partners. We don’t just treat these companies as suppliers, we become partners with them and develop alongside them. We then make sure that the consumer recognises the functionality of a specific app as he or she has been familiar with on a smartphone or other device, but at the same time the user experience will have been totally integrated into the Volvo design language. Achieving this quality level of user experience is only possible by Volvo working closely with the suppliers. Secondly, we are adding directly integrated support for the deep functionality that Apple is providing iPhone users through CarPlay, embedded as part of the user interface. And here we feel we have an advantage as we are – together with Tesla – the only ones to offer a portrait-mode screen. As a result, CarPlay will be naturally embedded as part of the user interface, as opposed to most of our competitors who have landscape format screens. In those cases, the CarPlay interface fully takes over the OEM interface, meaning that you have to switch backwards and forwards between those two worlds, making the user experience less seamless. At the same time, we’re working with Google to bring Android Auto into the cars as well. Finally, we also offer standard Bluetooth streaming for people wanting to use other apps or services from their smartphones.

This is how the multi-layered approach works. We will continue to work with the app developers to bring their apps into the Volvo app platform, because while we know that CarPlay and Android Auto are qualifiers for the premium car companies, we know that we do it better with our own platform.

On top of this it is important that there is an integrated 3G/4G module to support the connectivity aspect. The consumer can add his or her own data plan (SIM) so that as soon as the car is switched on it is always connected to the Internet. You don’t need to have your smartphone with you and you don’t need to set up a Bluetooth pairing connection. This connectivity is handled by our telematics system, which allows remote control of functions of the car such as remote heating and cooling, locating the car, lock and unlock functionality etc, all via a smartphone. This functionality has been in place for 5 years now.

**VOLVO:** We are really happy not to be in that business! It’s a maintenance headache because you need to make sure that applications are continually updated on the phones. We would rather do it on the correct side, which is on the head unit, and then we add CarPlay and Android Auto for additional customer benefits. In addition to this, the Ericsson cloud platform allows us to enable our own services and back-end assistance such as a connected service booking function, so we are not only working with third-party service suppliers, we are our own third-party, value added service supplier for Volvo cars.

**CC:** It all sounds marvellous, but as I’m sure you will know only too well, connectivity issues are still the number one consumer complaint according to J D Power’s research. How is Volvo addressing these problems?

**VOLVO:** It’s a difficult topic, that’s for sure. Since we launched Bluetooth telephony we have always had customer complaints. It doesn’t matter if it is our fault, or the phone company’s fault – at the end of the day the customer isn’t happy and is complaining to our dealers. We are not alone, all car companies are experiencing this – some more than us. It is hard to see how this will not be an ongoing problem, as software constantly needs updating from the device manufacturer’s side, and it is not always properly tested. What we – Volvo – can do, is to continually work to make it easier for the customer to understand what to do when there is a problem. We are constantly working on making the Bluetooth pairing process easier, for example, and last year we introduced our support site (Volvo Connectivity Support) which provides lots of information to help our customers resolve the most common problems.

For the bigger, longer-term picture, this is where the embedded modems in premium cars do make life easier, as the customer doesn’t need to do anything to get connected. Every Volvo car shipped to the USA is connected via the AT&T arrangement, and it is hard to imagine that life could be made any easier than doing it that way – you start the car and you are automatically connected to the AT&T network.

**CC:** Indeed, well, let’s finish off our talk today by considering something that struck me recently. As part of its XC90 launch programme, Volvo is running some beautifully crafted TV commercials for the car. However, these make no mention of the cars connected functions. When other manufacturers are making a big play of connectivity, is it a conscious decision on Volvo’s part not to do so?

**VOLVO:** It is deliberate, and well spotted! We see that there is so much promotion of the Connectivity aspects for when this functionality is enabled on more of our cars. That is the point when we will push what could be termed the ‘utilitarian’ aspects of the cars. Right now we are majoring on the halo effect of the new XC90.

**CC:** Other car companies, such as Ford with SYNC and BMW with ConnectedDrive, are using the smartphone as not only a control device for functions in the car, but are also transferring some of the processing functions onto the smartphone. How important do you consider the smartphone to be as an interface between the user and the car? In some ways Volvo is using it as a valuable and useful tool, and in some it is not.
DIGITALISATION TO DRIVE BMW STRATEGY, BUT WILL THIS CAR COMPANY GO THE SAME WAY GOOGLE DID?

By Vince Holton

FROM THE OVERVIEW THAT I WAS GIVEN RECENTLY HERE IN THE UK (SEE THE CONNECTED CAR VIDEO FEATURE BELOW), IT WAS CLEAR THAT BMW'S IN-CAR SYSTEMS ARE BECOMING EVER MORE SOPHISTICATED. IT WAS NO SURPRISE, THEN, TO READ THIS STATEMENT BY HARALD KRÜGER, CHAIRMAN OF THE BOARD OF MANAGEMENT OF BMW AG, WHICH WAS PART OF AN UPDATE SENT TO CONNECTED CAR DURING AUGUST, AND WHICH SUGGESTS THAT BMW COULD WELL METAMORPHOSE INTO A VERY DIFFERENT TYPE OF COMPANY.

Harold Krüger: “The decisive question that guides our actions is: What kind of company do we want to be in the future and how do we set the right course?

“Above all, digitalization and the associated technical possibilities, are set to change the automobile and its fundamental role in our society. Digitalization will also change the whole process of industrialization in our sector. The car could be viewed as the largest mobile data storage device and will be an essential element of the “Internet of Things”. Following the technological change towards sustainable mobility, this is the next radical change for our industry.

“We regard new technological trends above all as new opportunities – for the car, our industry and customers. Based on this, we are currently conducting a comprehensive update of our strategy. At this stage it is still too early to go into further detail. For us, “speed” is important, but it is more important to look at possible trends and carefully analyze them both from a qualitative and quantitative point of view. The goal is to align our strategy with future challenges up to the year 2025 and beyond.

“With ConnectedDrive, Future Retail, DriveNow and digital services, we offer customers a wide range of services and connectivity. For a long time now, we have been far more than just a vehicle manufacturer.

“The acquisition of Nokia’s mapping and location services business, HERE, by the three German premium car companies is a further strategic step. The acquisition is intended to secure the long term availability of HERE’s products and services as an open, independent and value creating platform for cloud-based maps and other mobility services. This platform is and will be accessible to all customers from the automotive industry and other sectors.

“HERE will play a key role in the digital revolution of mobility, combining high definition maps and data from vehicles to make travel safer and easier for everyone.

“HERE is laying the foundations for the next generation of mobility and location based services. For the automotive industry this is the basis for new assistance systems and, ultimately, fully autonomous driving.

“As you can see: We are taking strategic decisions with a long-term perspective. We are aligning our business model to the complex challenges of today and tomorrow. We also continue to invest in the company – in our products and brands, new services and our production sites worldwide.

“We will continue to adapt the BMW Group to meet future challenges. And our company will further strengthen its position as a provider of individual mobility in the premium segment. In this area, we also intend to be the leader.”

Which begs the question: if we were to somehow fast-forward 20 years, would we recognise BMW as the same company we know today? Dare we suggest that far from being a pure, automotive product company, BMW could have become an IT company, perhaps even evolving into a data-driven, multi-faceted services company? And dare we go even further and suggest that BMW (and other car companies, of course) could follow Google, and quietly evolve one modus operandi – car-making – into another – that being a Google-style advertising platform?

Today, BMW is likely to regard such a suggestion as heretic, but think back. When we all started to say “let’s Google that” a few years ago, did we really know what Google’s long-term plans were? Or how its search engine would be developed into the data capture monstrosity that basically now owns our lives? How Amazon would take over the world of retail, and where we would all ultimately be led?

I think not.

With my Nostradamus hat on for a moment, I beseech you to remember these words, and to recall them in 20 years’ time when a BMW drone delivers your weekly shopping, and points out that as you are getting a bit thick around the midriff, perhaps you might like to buy some BMW running shoes and a low calorie BMW energy drink?

Click on the movie screen below to watch Connected Car's overview of BMW ConnectedDrive.
QUALCOMM AND BRUSA SIGN WIRELESS ELECTRIC VEHICLE CHARGING LICENSE AGREEMENT

Qualcomm and BRUSA Elektronik have entered into a Wireless Electric Vehicle Charging (WEVC) patent license agreement. BRUSA, an automotive Tier 1 power electronics supplier, has licensed Qualcomm Halo patented inventions to commercialize WEVC systems for Plug-In Hybrid and Electric Vehicles (EVs). Under the terms of the agreement, Qualcomm granted to BRUSA a royalty-bearing patent license to develop, make and supply WEVC systems for certain automobile manufacturers.

BRUSA Elektronik has been pioneering technology in this area with its “ICS” wireless charging system which the company claims can transfer power to vehicles safely and at high efficiency, eliminating the need for charging cables currently required by EVs. BRUSA has developed its own coil geometry called FRAME technology. The coil is rectangular and enables inductive charging of electric vehicles with the integration of power electronics both in the vehicle and in the base plate enabling a one box system. BRUSA will work with certain major automotive manufacturers to commercialize its wireless charging system including specific aspects of the Qualcomm Halo inventions. Josef Brusa, CEO of BRUSA Elektronik AG told Connected Car: “Wireless charging will win, it will give e-mobility a big boost, it will set new, sustainable technology apart from old gasoline-based technology. We are determined to make wireless charging a reality. We already offer technically sound and commercially viable systems to the market and we are excited about the potential of wireless charging.” BRUSA is apparently working on WEVC systems with several leading automakers that have firm plans to introduce wireless charging in their automobiles in the near future.

MERCEDES-BENZ LOOKS INTO THE FUTURE

Mercedes-Benz calls its “Concept IAA” (Intelligent Aerodynamic Automobile) two cars in one: an aerodynamics world champion with a Cd value of 0.19 and a design-led four-door coupé. The concept car, which celebrated its world premiere at the Frankfurt International Motor Show, switches automatically from design mode to aerodynamic mode when the vehicle reaches a speed of 80 km/h, when numerous aerodynamics measures alter the shape of the vehicle. Inside, the “Concept IAA” offers new touch-based functions and provides Mercedes-Benz idea of what the interior of a business saloon might look like in the near future.

The car features Car-to-X technology, for example, which enables it to communicate with other vehicles or other sources of information. Mercedes predicts that this technology will provide a major advance in helping to avoid accidents, as obstacles or events which are not visible to the vehicle itself can be detected - the “Concept IAA” is able to look around the corner, as it were.

The interior apparently continues the design line of the S-Class and S-Class Coupé. OFN (Optical Finger Navigation) buttons, embedded in the clusters in a similar hovering manner as the touchpad in the centre console, enable the driver to scroll through the instrument cluster menus. The OFN button on the left controls the left-hand display, while the button on the right controls the right-hand display.

Mercedes-Benz suggests that the “Concept IAA” offers a foretaste of the business saloon of the near future. The company’s view is that all of these exterior and interior features and operating concepts preview not just the way our cars will look but also the way we will interact with them, and before too long.

BOSCH AND TOMTOM PARTNER ON MAPPING TECHNOLOGY FOR AUTOMATED DRIVING

The two companies have agreed to collaborate in the area of maps for highly automated driving. Under this agreement, TomTom is designing the necessary maps, while Bosch, on the basis of its systems engineering work, is defining the specifications these maps have to meet. The maps are already being used in the automated vehicles Bosch is testing on certain public roads in Germany (A81) and in the United States (I280). Commenting on the importance of this venture, Bosch board of management member Dr. Dirk Hohesel told Connected Car: “Only with high precision maps will automated driving on freeways be possible from 2020.” And Jan Maarten de Vries, Vice President Automotive at TomTom, added: “By the end of 2015, we want to have new high-precision maps for automated driving for all freeways and freeway-like roads in Germany.” Road coverage will subsequently be extended to the rest of Europe and North America.

Maps for highly automated driving and the maps used in current navigation systems differ primarily in two respects. First, accuracy is significantly higher – down to decimetre precision. Second, the map material for highly automated driving consists of multiple layers. The traditional base navigation layer is used to calculate routes from A to B, including the sequence of roads to be driven. The localization layer uses a positioning concept providing highly accurate map data, which the automated vehicle uses to accurately calculate its position within a lane. To do this, the vehicle compares its sensed environment with the corresponding information in the localization layer.
ALL KNOW THAT THE CELLULAR OPERATORS WIELD A LOT OF POWER AND INFLUENCE WHEN IT COMES TO ARCHITECTING THE WAY PEOPLE AND DEVICES COMMUNICATE WITH EACH OTHER. AND YET, AFTER MANY YEARS OF DOMINANCE THE NETOPS ARE FACING NEW CHALLENGES. AS THE INTERNET OF THINGS, MACHINE TO MACHINE (M2M) AND SMART CAR/SMART CITY/SMART EVERYTHING MARKETS DEVELOP, THEY MUST COMPETE IN THEIR OWN BACK YARD WITH FEISTY NEW COMPANIES PROMOTING LOW-POWER DATA NETWORKS, AND THEY MUST WORK WITH NEW CUSTOMERS. SELLING A GLOBAL, BACK-OFFICE CONNECTIVITY PLATFORM TO THE WORLD’S LARGEST CAR COMPANIES IS AN ENTIRELY DIFFERENT PROPOSITION TO SELLING A NEW IPHONE TO A CONSUMER. SO, HOW ARE THEY COPING? TO FIND OUT, VINCE HOLTON SPOKE WITH MATT KEY, WHO, FOR A NUMBER OF YEARS HAS BEEN STEERING VODAFONE’S M2M BUSINESS.

VH: How important is IoT/M2M to network operators such as Vodafone?

MK: Hugely important. To the point that we see this as one of the key activities that will be the future of the communications service providers and global network operators. It’s an area we are hugely committed to. In the 6-7 years that we have been involved in Machine to Machine (M2M) development, the business I look after has gone from a couple of people, to a half a billion pound turnover business with 1300 staff. But it is not just network operators such as Vodafone.

We see the IoT as being crucial to the future of the huge number of different types of businesses involved in the network and in the secure capture, transit and analysis of data. The key components will be the device - which we understand very well at Vodafone, the space – which could be the room, the building, the office, or the city. Then there is the vehicle – it could be a car, or it could be a bike, or a truck, a train or an airplane. Then there are the interfaces and the transitions between these things. These might be core connectivity, energy or it might be more nebulous things such as rights, identity or ownership of data.

The truth is that it’s nice to be involved in something that everyone is so massively interested in.

VH: Yes, but at the same time as being interested, people are also terrified that they may not be part of it, or left out, don’t you think?

MK: Well, yes, and from our part it is great to be considered by Gartner to be global number 1 in this space, but at the same time this creates a real pressure to maintain that position, and to stay part of the ecosystem, especially with all of the new companies that are joining that were simply not there 2-3 years ago.

VH: Do you think that in the M2M/IoT environment and in Smart Car, Smart City, the cellular network operators can compete with those new players like Weightless, for example, who are launching IoT networks in unlicensed, free spectrum, claiming that their solutions...
are lower cost, lower power and much better optimised for IoT than cellular-based networks?

**MK:** I think M2M is going to be a really broad ecosystem of devices, networks and providers. Vodafone is primarily a cellular operator and a satellite comms provider, but we are also a massive fixed line provider, and our fixed line business is equally applicable to the IoT and M2M space. In addition to this you have probably seen from recent announcements that we are developing our own low power cellular network for M2M, which we call Cellular Internet of Things. Ultimately we want to be the gateway for our customers so that they don't need to worry about what transport layer their data is passing over – they can be connectivity agnostic.

I do think that some of the low-power network solution providers who are operating in unlicensed and unregulated spectrum are doing a great job, but there are use cases that are more attuned to more established technology solutions, and that when it comes to extending their IoT networks into the vehicle, they may well struggle to offer value, coverage and secure systems.

**VH:** OK, well we are now coming onto IoT in the car. Vodafone has created and publicised a video on the subject of automotive IoT. Can you tell me the background to Vodafone’s thinking?

**MK:** Automotive is still probably our largest vertical sector within Vodafone M2M. There are a couple of reasons for this. First, Vodafone identified the M2M opportunity in the automotive sector before many others – pre-IoT. I’m talking basic monitoring, performance tracking and assessment and the control and modification of some of those parameters. That evolved into services on top of that – vehicle tracking, stolen vehicle recovery, Internet in the car etc. So we were early in providing base connectivity for early adopters in this market. It’s public domain information that Vodafone supports many of the world’s largest automotive brands, and the ones we can talk about in the public domain include BMW, Jaguar Land Rover, Porsche, VW/Audi, Daimler and Mahindra Reva in India. We have learned and evolved alongside these companies as they have learned what M2M and IoT might do for them. We and they understand that while the network is a core enabler, it is not all that is required to provide the customer with the solutions and the value that they want.

So we invested heavily not only in the core network development and SIM management, but also in technologies and partnerships that could help us offer automotive customers these broader services. Perhaps the most important example of this was when Vodafone bought Cobra Telematics last year. The goal was to give us increased access to all aspects of automotive and much more specialist industry knowledge and to be able to offer a true end-to-end service. For example, with the Porsche’s Car Connect service, we not only provide the telematics and in-car Internet, but we also provide a full solution for stolen car recovery – if a car is missing, we will deal with the customer, we will track the car and identify its location, we will deal with the authorities and will even manage moving the car to wherever it needs to go.

**VH:** OK, well let’s drill down a little deeper. When you say you ‘support’ the manufacturers, what does that support boil down to?

**MK:** Automotive companies are massively complex to support due to the long lead-times of the manufacturing process, the legislation that they are governed by and the fact that they are embracing so many leading edge technologies. We need to be a partner with them rather than simply a supplier, and from very early on we have to be part of the new car design process, enabling the services that will be included. As well as having to master our own processes, we have to know, understand and master the processes of the car company too.

We have to understand all of the components in a new car, what they are, what they do, what is needed and who is going to provide those components - and when – and all from very early on. We have to be ingrained in the car company’s thinking. We can bring quite a lot to the table, because when it comes to the consumer that will be driving the car, and that person’s needs and expectations of what the car will do for them – beyond what he would expect from a standard car company offering – Vodafone has a great deal of experience. We understand consumers, consumer devices and the services that run over those devices.

**VH:** Basically, though, Vodafone is providing the core network platform, isn’t it?

**MK:** Yes it is but also the device management platform, the physical devices the consumer will bring into the car, apps or complete software platforms such as Porsche Car Connect that run on iOS, Android or the iWatch. We also have design and manufacturing capability that came as part of the Cobra acquisition. This means we are much more than just the network provider, we are providing much more of the complete supply chain. If a car company says that it needs a new telematics box to do X, Y and Z, we have the design, manufacture and test capability to do this and to deliver it.

In addition to equipping new cars, we also have a large aftermarket business to help customers make the cars that they already have better, and better connected. Vodafone really does have a layer of expertise and capability in the automotive sector that goes above and beyond what you would expect from a network operator.

**VH:** What do you consider to be the net ops specific role in connected car?

**MK:** We feel that we have a crucial role to play as the car evolves into being a critical component of the Internet of Things. If you have data being gathered about where a car is, whether it is hot or cold, how it is being driven, this is interesting not only to the automotive manufacturers. They realise that this data is also very interesting to many, many other organisations too – insurers being a prime example. Insurers are using that data to offer pay as you drive, or usage-based insurance. Applications like these are the justification for the intense focus that Vodafone has put on the automotive sector, and as the IoT develops then Vodafone’s contribution and skill sets become of interest to a broader, more lateral set of companies. Only this week, for example, it was announced that Vodafone helped BMW launch its DriveNow product, which is effectively a car-sharing service – pick up a car at one point, drive it for a while and drop it off. It is the systems and technology that Vodafone has created that allows that sort of service to be offered.
VH: But aren’t these services limited to customers of just your network?

MK: That really does vary. In many instances the services a customer is using in the car are provided as part of the service contract offered by the car company as part of its connected car package. This is tied to the factory-fit SIM or module that is installed in the car. The reality is that the car driver assumes he is dealing with the car manufacturer, and may well be unaware that Vodafone is providing the network platform.

Then at another level, this is overlaid with the roaming agreements that Vodafone and other network operators have agreed, whereby, if coverage becomes patchy on one network, the M2M SIM in the car will be seamlessly switched to the next best available network.

As we have rolled out these services we have found that the automotive companies seem to fall into two camps. There are those, like BMW and Porsche that have decided to manage the online services that their customers use in the car, and then there are those that are offering more of a ‘mirroring’ strategy, whereby they enable the use of apps and services that are brought into the car on the consumer’s mobile devices.

Most of the car manufacturers that Vodafone is dealing with are those that recognise the value of the data that their cars are generating and who want to control the in-car Internet experience. As well as recognising the value of the data, they also see it as an extremely good way of building a direct relationship with the driver, which has previously not been the case. Until now, direct connection with the driver has been restricted mainly to the dealer, insurer or finance provider.

VH: Are we likely to see Vodafone participating in widely-publicised connected car projects such as the AT&T, Ericsson, Volvo project in the USA?

MK: This really comes down to being a branding decision. It is probably true to say that Vodafone is already involved in similar projects, but for a variety of branding reasons this is not always jointly promoted or publicised. It is probably also true that this type of promotion is more commonplace in the USA than in Europe or other markets. It would be nice if more European companies were a bit more outgoing! In the meantime we are quite happy to sit in the background and provide a robust service that works for the manufacturers and the customers.

VH: Well, for all of the excellent applications and services that are becoming available to car drivers, it is widely acknowledged that connectivity issues are the biggest cause of complaint for car users, and security and privacy issues are up there too. Does Vodafone acknowledge this, and what can you do to help?

MK: Security is at the heart of everything we do and of everything we design. That’s bottom-up network security, SIM security, device security – this is at the core of what we do. There must be no compromise of that as a principle. Referring back to the low-power IoT networks that we talked about earlier, which are operating in unlicensed, unregulated space, this is where we have a real advantage when it comes to providing truly secure solutions. We own the network and the access and exit points and this provides us with a significantly better chance of delivering a secure, end-to-end service.

Where interoperability issues are concerned, once again we see that there are differing levels of responsibility accepted by the car companies. There are those that want to own and operate the environment inside the car, and those that are happy to let the car’s systems be run by the mobile device that the consumer brings into the car. In the latter case we see that this is working pretty well today, with micro-networks running over Bluetooth or Wi-Fi, and in truth Vodafone is not really becoming involved in resolving interoperability issues. We do understand that for our customers, getting this right is a challenge and one that requires big investment. Operators like Vodafone have spent many years making it very simple for customers to receive their new phones or mobile devices, switch on, register on the network and just get going. By comparison, this is a brave new world for the car companies as they get into a direct interaction with their customer and with his or her attempts to become part of the connected car or Internet of Things ecosystem. There will have to be a significant focus on making the process simple and streamlined.

VH: So does Vodafone get directly involved in helping car drivers to use the connected systems that it is enabling, or perhaps advice on dealing with interoperability issues?

MK: We don’t do this as a specific, consumer-facing product or service area, but we certainly help our automotive customers think about user interfaces, for example. As an instance of this we will shortly be announcing a project with a large automotive client where Vodafone worked very closely with the car company to architect the way a driver can select and implement a package of services once his free in-car Internet period has ended. We can do that because we have millions of customers coming on- and off-contract every year, which gives us unrivalled experience of managing the process and making it really simple, and really easy.

We do this because we understand the critical importance of retaining customers.

Information about Vodafone’s automotive M2M portfolio, including an interesting video, can be found at this link: http://www.vodafone.com/business/m2m/automotive
We monitor web video presentations on the subject of connected car technology on an ongoing basis, and each issue will include a selection that we have reviewed. If you spot great videos, or would like to put forward your own company’s video for inclusion in a future issue of Connected Car, contact us.

Click the movie screens to watch the videos

- **Pivotal Connected Car Demo.**
- **Ericsson: Driving the connected car.**
- **GM Canada’s new mandate: The Connected Car.**
- **Vinli - Your Car Connected.**
- **The Connected Car: What Feature Is Most Important To Consumers?**
- **Google: Android for Auto.**
- **Visa Connected Car.**
HAS BEEN WIDELY REPORTED THAT DURING JULY THIS YEAR, CHRIS VALASEK AND CHARLIE MILLER, A COUPLE OF WILY SECURITY RESEARCHERS, WERE ABLE TO WIRELESSLY HACK AND TAKE OVER CONTROL OF THE STEERING, BRAKES AND TRANSMISSION OF A CURRENT SPEC JEEP CHEROKEE AS IT WAS BEING DRIVEN, ALL DONE VIA THE INFOTAINMENT SYSTEM. VALASEK AND MILLER (A CYBERSECURITY EXPERT WHO USED TO WORK AT THE USA’S NATIONAL SECURITY AGENCY) USED A HIGHLY ELABORATE AND DETAILED PROCESS TO EXPLOIT THE FACT THAT FCA’S UCONNECT INFOTAINMENT PLATFORM IS ALSO CONNECTED TO USA SPRINT MOBILE DATA NETWORK. THE ONLINE FUNCTIONS OF THE UCONNECT SYSTEM ALLOW USERS TO REMOTELY ACCESS FUNCTIONS ON THEIR VEHICLES.

Fiat Chrysler Automobiles (FCA) responded quickly, and launched a voluntary recall of some 1.4 million vehicles. The company’s statement, which we believe it is important to reproduce in full, said:

“FCA US LLC is conducting a voluntary safety recall to update software in approximately 1,400,000 U.S. vehicles equipped with certain radios. The recall aligns with an ongoing software distribution that insulates connected vehicles from remote manipulation, which, if unauthorized, constitutes criminal action.

The Company is unaware of any injuries related to software exploitation, nor is it aware of any related complaints, warranty claims or accidents – independent of the media demonstration.

Further, FCA US has applied network-level security measures to prevent the type of remote manipulation demonstrated in a recent media report. These measures – which required no customer or dealer actions – block remote access to certain vehicle systems and were fully tested and implemented within the cellular network on July 23, 2015. The Company is unaware of any injuries related to software exploitation, nor is it aware of any related complaints, warranty claims or accidents – independent of the media demonstration.

Customers affected by the recall will receive a USB device that they may use to upgrade vehicle software, which provides additional security features independent of the network-level measures. Alternatively, customers may visit http://www.driveuconnect.com/software-update/ to input their Vehicle Identification Numbers (VINs) and determine if their vehicles are included in the recall.

The software manipulation addressed by this recall required unique and extensive technical knowledge, prolonged physical access to a subject vehicle and extended periods of time to write code.

No defect has been found. FCA US is conducting this campaign out of an abundance of caution.

Customers are urged to acquire the software update.

Note – the bold type and italicisation is FCA’s, not ours.

The hack’s perpetrators duly responded to FCA/Sprint’s actions, Valasek tweeting praise for their response in quickly blocking the attack and issuing the recall for 1.4 million cars.

"Looks like I can't get to @0xcharlie's Jeep from my house via my phone. Good job FCA/Sprint!"  
Chris Valasek @nudehaberdasher

The reality is that connected car and the whole Internet of Things (IoT) ecosystem are facing similar issues to those that the PC industry has experienced. It’s interesting to note how the approach to security...
evolved as computers around the world started to go online. Microsoft Windows launched in 1985, but it would be almost ten years before Windows Update site was introduced (and three more before it delivered live security updates). Microsoft eventually realised that in fact no operating system that was open and easy for end users could be perfectly secure. Microsoft now works with security researchers and relies upon disclosures from white hat hackers to identify and fix flaws before they can be widely exploited. Indeed, Microsoft, Google and others now incentivise security researchers to find vulnerabilities at regular “Hackathons”, with big rewards going to those who find and disclose issues before they can be widely exploited. This concept is already being considered in the automotive sector, witness the fact that the Canadian military has offered $630,000 to anyone that can carry out a hack on a vehicle, and which will then work with Canadian authorities to find a solution.

This picture of global vulnerability to hacking is currently only getting bigger as the online ecosystem evolves. Many online devices are found to have vulnerabilities in the IoT and it’s interesting to note the approach to fixing them. Recent examples are Belkin’s WeMo home automation devices, where a security flaw potentially allowed unauthorised remote access to the devices. This was quickly addressed by a firmware update. However commercial pressures and economies mean that responses to vulnerabilities cannot always be so well managed when low cost generic devices are connected. A flaw in Universal Plug and Play (UPnP) was discovered in a high proportion of home routers, allowing hackers to access the routers configuration from the internet and potentially gain access to private data on internal networks. Many routers are considered commodity items and updates to such devices can be limited, and even when available such updates are installed only by end users who proactively search for them. Many average users are unaware of the problem and hardware support has almost certainly long since expired, leaving thousands unknowingly exposed. Meanwhile, the recent Android Stagefright flaw affecting huge numbers of Android users has proved challenging for those with older devices that are now outside the official update path and firmware is no longer being updated. Technical users can often find and install firmware updates but the average user will likely remain in the dark about the importance of such a proactive approach to updates.

A recent survey by Google compared the security practices and beliefs of experts versus average users. It rated the top ten approaches to online security of expert vs average users. At number one, security experts understand that frequent updates are key to online security while non experts still believe that running antivirus software is the most important protection to online threats (security experts understand that antivirus packages do little or nothing to mitigate zero day exploits – the most prevalent attack vectors online today). The best advice, confirmed by expert users, is that keeping products updated is the most important security action.

So, with automotive manufacturers already well versed in handling vehicle recalls and understanding the importance of long term consumer support, auto updating connected cars to patch security vulnerabilities seems an obvious answer, but there are technical challenges. While many cars are now online via high speed Wi-Fi and 4G connections, and could potentially download updates quite easily, once the download starts, the slow data transfer speed on the CAN bus inside the car may make updating nodes difficult. It is easy to see how a lengthy download could fail if a car is started while the download is underway, moved to a new location and stopped again. Furthermore, in enabling firmware updates and patches the industry will need to adopt certificate signing to prevent unauthorised third party modification of firmware update files, as this otherwise becomes a possible attack vector.

A PAN-INDUSTRY FIX SOME WAY OFF

While it may have been possible to aggressively hack the FCA system, a number of other car companies have been identified with similar possible attack vectors. It is widely acknowledged that Valasek and Miller had access to data that the average hacker would be unlikely to have, such as firmware code sources and the car’s IP address. Or as FCA puts it “unique and extensive technical knowledge, prolonged physical access to a subject vehicle and extended periods of time to write code.”

It is also the case that these two guys had and still have a deeply vested interest in promoting what they are doing. They are pitching themselves as cybersecurity experts and using the Jeep exercise as a highly public, self-promoting case study. FCA was just unfortunate to have been the selected target. With the current scramble to embed connectivity in cars it is known that similar security weaknesses exist in other vehicles on today’s roads, and many other car companies must be looking on nervously.

GRASPING THE NETTLE

It is not unreasonable to suggest that across the connected car and the wider Internet of Things sectors, security is potentially the poisoned chalice. Security is also something that tends to be the can (no pun intended) that is kicked down the road in the excitement of the average technology or product development cycle. If the vision of the connected car is to be realised, every car company, every Tier 1 supplier, every cloud platform and software developer needs to make security an absolute priority. Luckily, the automotive industry is well placed to grasp this nettle and has both infrastructure and resources to mitigate security vulnerabilities. For the wider Internet of Things however, which is founded upon a proliferation of ultra-low cost connected devices, and with low levels of ongoing support, the outlook for the average user may be less positive. Ultimately, the growth of the Internet of Things means an engagement not only of manufacturers, but also - crucially and for the time being at least - the end user in the security and maintenance of connected technologies.
JAGUAR F-PACE EMBRACES CONNECTIVITY AND WEARABLE TECHNOLOGY

The all-new Jaguar F-Pace is described by Jaguar as a performance crossover and its infotainment and connectivity technology is described as industry leading. The premium InControl Touch Pro system is based around a 10.2-inch touchscreen, with a quad-core processor and solid-state drive, and runs on ultra-fast Ethernet. As a result, Jaguar describes the user interface as “instinctive and extremely quick with sharp and incredibly responsive graphics”. Up to eight devices can be connected to the vehicle’s Wi-Fi hotspot at one time.

The navigation system can save you time by learning your commute, offers door-to-door guidance and can even advise others of your arrival time. Navigation can also be shown full-screen - in 3D - in the 12.3-inch HD virtual instrument cluster.

In line with current trends, the F-Pace includes a suite of advanced driver assistance systems. The stereo camera at the heart of the Autonomous Emergency Braking system now features a pedestrian detection function - a Jaguar-first. The stereo camera also enables Lane Departure Warning, Lane Keep Assist, Traffic Sign Recognition, an Intelligent Speed Limiter, and Driver Condition Monitor systems.

Key information such as vehicle speed and speed limits can be projected directly into the driver’s line of sight by the laser head-up display. Jaguar claims that compared to conventional systems, laser technology is smaller and lighter and the images remain clear even in bright sunlight.

And it seems that Jaguar is embracing wearable technology, as the F-Pace also brings the world debut of Jaguar’s Activity Key. This is a waterproof, shockproof wristband with an integrated transponder that is intended to support active lifestyles because it allows the keyfob to be securely locked inside the vehicle - invaluable if you’re going surfing, for example, or kayaking. Locking the all-new F-Pace using the Activity Key will disable any keyfobs left inside.

Connected Car asked Peter Virk, Head of Connected Technologies & Apps at Jaguar Land Rover for his take on the systems in the F-Pace:

“The Jaguar F-PACE is packed full of industry-leading connectivity and infotainment technology. It is by far one of our most connected vehicles to date. The F-PACE has Jaguar Land Rover’s latest InControl Touch Pro - the World’s most advanced infotainment system, developed in-house, with a powerful quad-core processor and ultra-fast Ethernet allowing up to eight devices to be connected to the WiFi Hotspot at any one time.

Through our Connected Car technologies, Jaguar Land Rover is bringing the power of the internet into its vehicles, developing a range of connected technologies from embedded to smartphone Apps. We have also developed a suite of InControl services that you can access while away from your vehicle from smartphones and the Apple Watch - enhancing the marriage between driving and technology”.

VISTEON AWARDED GLOBAL INNOVATION PRIZE BY NISSAN

Visteon has received a Global Innovation Award from Nissan Motor Corporation for a pioneering 7-inch display instrument cluster with advanced graphics, featured in the all-new 2015 Nissan Murano.

Hiroto Saikawa, chief competitive officer, presented the award to Visteon in a ceremony at Nissan’s global supplier event in Yokohama, Japan, attended by more than 200 global auto suppliers. Visteon’s Loick Griselain, vice president, Renault-Nissan customer group, who accepted the award for the company, told Connected Car, “We are honoured to be recognized by Nissan for this innovative instrument cluster, which represents a ‘first’ development milestone for both Nissan and Visteon’s Japan team.”

Based on Nissan’s mid-sized crossover platform, the Murano features Visteon’s first cluster program with an integrated 7-inch thin-film-transistor (TFT) display developed for Nissan. The cluster’s graphics were specified by Nissan to give the driver quick and easy access to vehicle and driving status – including maps, weather and speed limit – and to provide best-in-class functionality. The cluster also features turn-by-turn navigation, advanced driver assistance system (ADAS) warnings, hybrid electric vehicle (HEV) information management, 3D appliances for analogue gauges and synchronized control of the brightness of display and vehicle information.

Supporting 17 languages, the instrument cluster launched on the Nissan Murano platform across global markets this year.
CSR PLATFORM FOR DISPLAY AUDIO INFOTAINMENT AND SDR TUNERS

Semiconductor company CSR, recently acquired by Qualcomm, has announced the CSRatlas7, which it says offers automobile manufacturers a highly integrated, cost-effective, pre-packaged Display Audio solution. By integrating infotainment, connectivity and location features in a single turnkey system on a chip (SoC) solution for the in-vehicle environment, CSR is claiming that it can enable the cost-effective extension of new features usually associated with high-end vehicles, to entry and mid-level cars. CSR is also entering the car radio tuner front-end market with tuneX, combining hardware and software to provide a software-defined radio (SDR) solution.

The CSRatlas7 application processor has a dual-core CPU and GPU architecture with integrated peripherals, including Bluetooth, Software Defined Radio (SDR), GNSS baseband, an audio DSP and audio-codesc components. Advanced infotainment features enabled by CSRatlas7 are intended to provide consumers access to in-vehicle infotainment and navigation applications via the head unit. For example, the CSR aptX audio codec is integrated for wireless audio streaming.

The software and hardware solution is available with a number of differentiating software stacks including CarPlay and Mirrorlink for streaming multimedia between the external devices and the in-vehicle infotainment system; cVc for high fidelity audio over hands-free applications; and SDR with tuneX front ends that support all worldwide radio standards. The chipset comes with a pre-integrated and qualified software package to reduce the complexity for infotainment system providers.

CSR offers tuneX front-ends or tuneX software demodulators as standalone products or as part of an integrated radio package on the CSRatlas7 platform. CSR can also offer tuneX as a solution working on a third-party platform.

HARMAN SUPPORTS V2X CLASSROOM EXPERIENCE

Square One Education Network and Harman International are gearing up to bring vehicle-to-infrastructure (V2X) development to life in K-12 classrooms throughout Michigan. To kick off this initiative, Square One and Harman—working with content partners P3 Group and PTC—held their first teacher workshop during August at the William D. Ford Career-Technical Centre, where teachers developed the first prototype classroom kit of materials that that was presented at several Michigan schools in September.

The partnership with Harman will assist in driving Square One’s hardware- and kit-focused teacher workshop model. The model provides participating teachers with the necessary training and classroom equipment for students to actively pursue V2X research, design and demonstration activities. The collaboration apparently supports Square One’s initiative to connect students with industry professionals to give them access to technology, engineers and opportunities that encourage the exploration of science, technology, engineering and math (STEM) careers. In addition to supporting these activities, Harman presented Square One with a $10,000 donation for teacher training, including V2X technology starter kits and workshops.

Phil Eyler, President of Harman’s Connected Car division commented, “At Harman, our goal is to lead the automotive industry in new connected technologies that make the in-car experience seamlessly productive, entertaining, safe and secure. Extending this investment into education—particularly in the emerging world of V2X technologies and services—is a natural fit and one we are proud to support.”

Harman also plans to adopt local schools within the new V2X Lab School Network to further support in-classroom participation at any level.

KENWOOD MULTIMEDIA UNITS INCLUDE BOTH APPLE CARPLAY AND ANDROID AUTO SUPPORT

Kenwood claims that its DDX9902S and DDX9702S are currently the only aftermarket receivers equipped with Apple CarPlay and Android Auto, which allows users to switch between connecting an iPhone or Android-based phone without having to manually change settings or reset the unit. This enables multiple drivers of the same vehicle to plug in the phone of their choice and enjoy their entertainment options and driver-centric apps.

The set-up seems quite sophisticated. Once a smartphone is plugged in, voice recognition and voice playback become the primary means of controlling audio and entertainment from the smartphone. With Apple CarPlay, Siri enables users to control, read and reply to messages and more by simply speaking, and provides access to music, podcasts, and Apple Maps for full-featured, voice-controlled navigation. With Android Auto, Google voice actions let drivers and passengers play music selections, get driving directions and hear turn-by-turn navigation, while Google Now cards highlight location- and preference-aware information at the right time.

Kenwood’s intention is that the two double-DIN DDX units will be the centre of a vehicle’s entertainment and information system. A large, 6.95-inch resistive touch display puts navigation, back-up camera view, and audio/video entertainment options at the driver’s fingertips. Both units are equipped with Bluetooth for playback of streaming media from a Bluetooth-enabled phone or media device as well as handsfree phone conversations. In addition, native control of Pandora and iHeartRadio provide an integrated entertainment interface when using a connected smartphone.
This article aims to discuss the phenomenon of audio fragmentation and how it manifests itself in vehicles, or with other devices like Bluetooth speakers that have been connected to the mobile when streaming audio.

In an ideal environment, there would be no audio fragmentation, but RF conditions are never ideal. Audio fragmentation is also indicative of other issues that may happen before fragmentation is noticed acoustically and can cause missing SMS alerts or invalid call setups.

This article explores some of the reasons for this fragmentation and how it can be reduced or eliminated by changing the orientation or position of the mobile to mitigate the effects of the human body, or when metallic objects reflect or scatter the RF signals.

Buffering
Bluetooth A2DP Audio is buffered. If it wasn’t buffered, then audio fragmentation would be much more prevalent. For reference: 48 A2DP (SBC) packets (3dh5) are transmitted every second, below this data rate some level of audio fragmentation will occur. Different devices have varying buffer sizes - typically, between 100ms to 250ms. Though larger buffers perform better, they also induce lags such as significant delay when changing tracks.

There are several buffers involved; the first is on the stack from the mobile, the second is the mobile’s Bluetooth chip, third is the infotainment center’s Bluetooth chip, and finally the stack inside the infotainment center. Buffer overflows may be caused by poor buffer management, time sensitive audio packets (synchronization) or due to higher priority traffic passing through the Bluetooth link.

Definitions of audio issues
Audio fragmentation can occur when not all A2DP packets are received and the infotainment system’s buffer is drained, and audio disruption will noticeable to the user. Audio fragmentation generally manifests itself as gaps in the music and/or music skips. Audio gaps are caused by buffer underflows and music skips occur from buffer overflows or when time-sensitive audio has to discard packets (note: packets may need to be discarded to keep pace, especially, for example, synchronization to video). If this happens, the audio will skip parts of the music stream. Music sounds faster when there is around a 10% packet loss, the most noticeable effect is that the music appears to speed up.

Music skips are defined as when the user can detect that the tempo of the music is faster, and in the worst case, parts of words of the vocals are missing. This is due to packets being discarded when buffers overflow. Normally, the packets can be throttled to avoid overflows, but there are cases where the packets are time sensitive and so discarded.

Skipping audio is rarer than audio fragmentation, and typically caused on the mobile’s side by poor RF not allowing the buffers to properly drain. With time sensitive packets some packets are discarded to ensure fidelity.

Factors affecting audio fragmentation in and around the vehicle
Audio fragmentation and music skipping are normally caused by low signal strength (RSSI) and/or high radio frequency interference (RFI). When this happens, the Bluetooth link suffers severe packet loss. The Bluetooth traces used for this article show packet loss across multiple channels, making this problem an overall Bluetooth issue, and not easily avoided by utilizing frequency hopping.

Low RSSI within the automobile
Although having a longer operation range for the Bluetooth link is normally desirable, another strategy is to reduce the range and improve performance over a shorter distance. The following are a list of factors that have effects on RSSI even at short range:

1. “Large body of water” (i.e. human body) in the path between the antennas. The human body can offer the signal strength dramatically.
2. 2.4 GHz radio waves are absorbed very efficiently by water, making the human body a key factor affecting the signal performance. Additional people in the vehicle will further reduce signal strength.
3. Metal objects between the two antennas may also degrade the signal performance. Although the majority of vehicle interior trim is made from plastic, cloth & leather, many surfaces can be metal coated. Metalized plastics used in the dashboard will affect the in-vehicle signal profile. Similarly, cup holders often have a metal finish for hygiene reasons, and also present a convenient location to store the mobile device. This puts the mobile antenna in a metal container, potentially affecting device performance.
4. The bodywork of the vehicle can either focus the Bluetooth RF, disperse it, or create interference with out of phase reflections. A vehicle’s body style can have a significant impact on the range and quality of Bluetooth RF. Metallic trim can cause signal strength hot and cold spots within the cabin.
Some users have observed that older devices that are upgraded with new operating system (OS) software become less responsive due to the ‘operating burden’ on legacy hardware of the new OS or the effect of installing resource hungry apps. This may affect the ability of the mobile device to service resource intensive tasks such as audio streaming, and lead to fragmented audio. A similar scenario could also take place with the infotainment system, when memory capacity diminishes and software updates consume more resources.

The impact of reduced bandwidth as mobiles get more ‘connected’ every year, including low energy devices (watches, health monitors, etc.) and other Bluetooth peripherals, such as radar detectors. Streaming data that is passed into the infotainment system may have audio fragmentation due to reception over cellular or Wi-Fi connections, and therefore may not have anything to do with Bluetooth connectivity.

Bluetooth Phone Book Access Profile (PBAP) and Message Access Profile (MAP) are special file transfers that, once connection is established, will also reduce the bandwidth of audio packets until the transfers are complete.

Of note: the Bluetooth Human Interface Device (HID) profile can be a major factor in audio fragmentation as it has an equally high service priority as audio, but typically HID doesn’t have high usage in vehicle.

TEST SETUP
The following is a description of the test setup used to recreate and measure audio fragmentation. For the charts and data in this article, all the results were recorded with this base configuration:

- Popular 2015 model SUV with three rows of seating, fitted with the company’s fully featured infotainment system
- Wi-Fi enabled on all devices (infotainment center and mobile), but not connected
- Engine running with air conditioning on, but the vehicle is stationary
- Vehicle is in a full car park with surrounding vehicles adding more reflected radio waves
- A2DP is the only Bluetooth function being tested, but MAP is used to mark the beginning and end of each test interval
- Test engineer was wearing normal summer clothes, jeans and pull over shirt with pocket
- Test engineer is the only person in the vehicle
- A Bluetooth sniffer was placed on top of the dash just over the head unit (antenna location)
- Signal strength scale 0->13, from the Frontline BPA 600 protocol analyser measurements. The infotainment signal strength is not a factor with the BPA 600 placed so close
- Buffer(s) size measured by comparing meta-data change to start of new song, when selecting the next track for this system - for this unit the buffer is approximately 250ms
- Each location, mobile location and direction was captured with at least 1 minute of audio
- For each test, the average signal strength, low signal strength, high signal strength, A2DP error rate including CRC errors and retransmitted packets are combined and finally the audio gaps are measured. Of course, the most significant metric is the engineer listening for audio issues.
- The test locations included all sitting positions in each row. Jeans left pocket, right pocket and shirt pocket were measured. The driver’s cup holder was tested. In each location the mobile was placed with the display away from the engineer’s body and then towards his body. The distance to the infotainment centre was measured for each location.
- Sub-Band Coding (SBC) codec was used throughout this test
- The retry /error rates shown in this article are strictly for the 3-DH5 packets. All other packet types were filtered out. Given the size and complexity of the 3-DH5 packet they are most likely to encounter errors.
- The last two charts were a pure distance measurement with nothing juxtaposed between the antennas. The measurements were through the rear tailgate with the tailgate open. Measured Distances were between 5 and 13 metres.

DATA AND DATA CHARTS
The error rate increases rapidly at 1.5 metres, but being under 10% indicates we had very stable audio. The slight nose-dive at the end is due to the 2.37 metres distance where the mobile is in the shirt pocket and has a better line of sight.

This chart shows that beyond the first row, the elevation of the shirt pocket means the mobile device has a stronger signal strength. The shirt pocket location has a better line of sight to the infotainment system and also reduces the RF absorption in the seats.

Error rate exceeds 25% in the last row, and should exhibit audio fragmentation if listened to for a long period (1 hour) even with a 250ms buffer.

The position of the mobile display (towards and away from the body) looks the same for this mobile, but the first row shows a significant difference, with the display towards the body providing a stronger signal. Although the average is about the same, the percentage of stronger signals is a good indicator of the differences in the two directions. Note: neither means that the signal is a direct shot to the infotainment system. An example would be the display towards the body providing a stronger signal. Although the infotainment system is the master, versus "3DH5 Null" if the mobile is the master. The one poll is based on the left hand axis versus the right for the 250ms buffer. Note the 100ms line is based on the left hand axis versus the right for the 250ms buffer, showing at least a 5x reduction in perceived audio fragmentation.

Same measurements but showing the audio gap data. After 9 metres, the audio fragmentation becomes very significant. This table shows the difference between a 100ms buffer versus a 250ms buffer. Note the 100ms line is based on the left hand axis versus the right for the 250ms buffer, showing at least a 5x reduction in perceived audio fragmentation.

These results show the estimated probability of audio fragmentation given 10 retries in a row. This is overly simplistic but does give an indication that a retry rate over 20% is likely to cause audio fragmentation.

**SUMMARY**

From these tests it is possible to conclude that:

1. Error rates over 10% can cause fragmentation but audible distortion is very noticeable when the error rate exceeds 25%. Audiophiles will notice the distortion sooner.
2. In large SUV’s and people carrier-vans, the 3rd row of seats begins to approach the limits of audio stability.
3. To minimize the likelihood of audio fragmentation, the shirt pocket is the best location in rows 2 & 3, while also keeping the mobile away from metal and as high as practical to provide a more direct line of sight.
4. With the body between the infotainment system and the mobile there is a 50% drop in quality - 15% versus 23% error rates. Figure 5 shows almost a drop of one unit in signal strength on average, with the most effect in the first row.
5. Distances beyond 8 metres show high retransmission rates and very noticeable audio fragmentation, while audio skipping was also observed. Beyond 10 meters the SMS Alerts became unreliable in addition to fragmented audio.
6. When the mobile is operating as a slave it will have more of an effect on fragmentation than when it operating as the master, since two messages must be received by the slave (two polls) versus only one when the mobile is the master (single null).
7. The infotainment centre used stopped polling for several hundred milliseconds when it encountered several CRC errors in a row, causing the audio fragmentation to be quite noticeable.
8. Buffer size is significant in absorbing short term transmission issues, but too large a buffer causes customer complaints due to lag in commands such as pause, play and track skip.
9. Seats and items on a seat or their back will reduce signal quality.

**RECOMMENDATIONS**

1. Use a Bluetooth Class 1 transceiver to improve the range. This is especially beneficial when mobiles are also Class 1 devices and, in certain situations, use of a Bluetooth Class 1 transceiver may provide some improvement for Class 2 mobiles.
2. Multiple Bluetooth antennas to improve coverage and diversity.
3. Make the mobile operate as the master to reduce the number of messages required to transmit. The difference is that a ‘Poll 3DH5 Poll’ is required for each packet if the infotainment centre is the master, versus ‘3DH5 Null’ if the mobile is the master. The one less packet for the same amount of data should make for fewer retransmits or less delays in transmitting the data.
4. Provide user education or guidance, including suggestions such as:
   a. keep the body from interfering as a result of getting between the two antennas
   b. If the mobile is kept in a pocket, have the mobile's display towards the body and use a front pocket.
   c. Shirt pocket or cup holder is best
5. Increase buffer size to reduce perceived audio fragmentation and music skips, perhaps up to 500ms.

www.nextgen-technology.com
LG COLLABORATES WITH FREESCALE ON INTELLIGENT DRIVING

LG Electronics (LG) and Freescale have entered into a memorandum of understanding to jointly develop next-generation vision processing solutions for camera systems, with the autonomous vehicle and advanced driver assistance systems (ADAS) market in mind.

The joint effort will enable LG to harness its experience and R&D capacity in camera systems, computer vision algorithms and electronics technologies to enhance existing ADAS technologies. In addition, LG is transferring technologies from its home entertainment and mobile communications businesses into automotive components. With Freescale's legacy of developing products for ADAS applications, both companies will apparently leverage each other's respective expertise to accelerate the evolution of automated driving technologies.

“We are excited by this opportunity to work with Freescale on next generation technologies such as ADAS,” said Dr. Lee Woo-jong, president and CEO of the LG Vehicle Components Company. “As the automobile evolves from a mechanical to an electronic system, LG will be in the perfect position to contribute its experience to the exciting area of driverless cars and automated driving.”

While Matt Johnson, vice president and general manager for Freescale's Auto MCU group added, “Freescale is pleased to partner with LG on IP development for automotive vision applications. The capabilities of each company are highly complementary and through sharing of key vision processing and automotive safety capabilities, both companies expect to accelerate development of differentiated solutions for ADAS applications.”

GEMALTO LAUNCHES CINTERION SECURE ELEMENT FOR PROTECTION OF AUTOMOTIVE AND INDUSTRIAL IOT SOLUTIONS

Gemalto, a company that develops digital security solutions, has introduced the Cinterion Secure Element, a tamper-resistant component embedded in industrial Internet of Things (IoT) solutions to enable advanced digital security and lifecycle management. The security framework, named Secure Element, serves as the foundation of trust for building the IoT security architecture. Gemalto believes this is crucial for long-lived industrial solutions such as connected cars and smart meters that need protection against evolving threats while remaining flexible to accommodate enhanced functionalities and services.

Gemalto claims that leading edge automakers have already begun integrating its Cinterion Secure Element in advanced security architecture and that Cinterion Secure Element meets extreme environmental and longevity requirements from the automotive industry and benefits from smart card level security. This ensures that data is stored in a safe place and access is granted only to authorized applications and people helping to guard against digital and physical attacks.

In addition, Cinterion enables secure over-the-air management of security credentials as well as software updates across the lifecycle of solutions.

Laetitia Jay, Vice President of M2M Solutions and Services at Gemalto told Connected Car, “Gemalto’s Security by Design approach and suite of M2M optimized solutions - including the Secure Element - provide end-to-end protection from the edge to the core. Security and trust among all types of connected objects such as cars, traffic lights or intelligent road systems, will enable a whole realm of innovations in the IoT ecosystem.”

BOSCH IS WEB-ENABLING PARKING SPACES

The key to active parking lot management is the reliable detection of available parking spaces. Bosch has apparently developed a special occupancy sensor that is scarcely bigger than a CD in terms of its circumference and measures around just three centimetres in height. The sensors are installed in parking garages and on-street parking spaces, either on or in the asphalt, as desired. The special thing about this technology is that the occupancy sensors operate wirelessly and are powered by batteries, which eliminates the effort and expense of having to lay cables. Each battery has a service life of up to seven years. Thanks to their robust plastic housing, the sensors are capable of withstanding any type of weather conditions, in addition to the increased wear caused by heavy trucks and snow plows. Inside the housing, Bosch installs two different sensor technologies that corroborate the information collected by the other and the company says that the benefit of this is enhanced, error-free reliability for detecting spaces.

The occupancy sensor checks at regular intervals whether a parking space is available. Using a gateway, which is similar to an internet router, the Bosch sensor relays the encrypted information securely to a server, where a real-time parking map of all free and occupied spaces is created that can be accessed with the app or online.

However, the service is not only for drivers, but also parking lot operators. Bosch says that it can further improve the occupancy rate of heavily-used parking spaces through intelligently evaluating the data.
Ericsson has a long and very strong background in the communications market, and Vince Holton talked to Konstantin Zervas about Ericsson’s role in the evolving connected car sector, including the company’s high-profile partnership with Volvo Cars and AT&T in the USA.

Konstantin Zervas is Director of Business Development at Ericsson. Today his focus is on Service Maintenance Strategy and the IoT. He has been part of Ericsson's Connected Vehicle Cloud Team since 2010, when he attended a Telematics Update Event in Detroit, which time also marked the point that Ericsson started to engage with this market.

VH: Give us a little of the background to Ericsson’s position in the automotive sector.

KZ: Ericsson has a strong legacy in telecoms – we’ve been working since 1876 when we started the whole thing! For some time now we have been focusing on a 3-step strategy. Part 1 was connecting places, part 2 was connecting people, and now we are working on part 3, which is perhaps the biggest step - connecting things – the IoT. Our origins are on the network side but it’s quite a natural evolution for us to engage with the different partners – the makers and developers in the different markets, the pioneers that want to transform their industries. These people are using enablers such as broadband connectivity and the cloud to build systems and applications.

VH: What is the Ericsson vision for the connected car and how would you differentiate yourselves from the competition?

KZ: We have always seen the connected car as a natural citizen in the connected society. But we see that not only does the car need to be connected, the whole transport system needs to be.

We feel that the basic embedded technology to connect the car and provide value added services is now in place, and so we are looking at the next stage. Our Networked City demonstration with Volvo at Mobile World Congress earlier this year, for example, showed how we are stepping beyond connecting the vehicle. We demonstrated remote control of two Volvo CE compact excavators over mobile networks in real-time. This was a full implementation of the 5G concept introduced at Mobile World Congress last year. This joint research project highlights what’s needed from future 5G networks, and what we can achieve with state-of-the-art technology. And the opportunity is huge.

Now we’re looking at connected safety and saving lives. It is not enough to connect the car with the driver, you need to connect them with the things around them. We have demonstrated how we can connect the car with cyclists, and make them aware of each other in order to prevent collisions.

VH: It sounds like your strategy is extremely ambitious, connect everything, not just cars!

KZ: Yes, that’s right. We design solutions for many industries, and then we work with developers in each sector to bring them together in the connected marketplace, where we are seeing a lot of interesting dynamics happening. What makes us unique is that while we are building solutions for individual industries, they are always overlaid on top of the same core or starting point - our horizontal, cloud platform. This uses a number of core components – service maintenance, analytics, the enterprise core catalogue and IoT billing that are all used when we build industry solutions. We can then leverage and learn from the experience we gain on each project across many and diverse sectors, constantly feeding this back to and continually improving our horizontal platform.
VH: Connected Vehicle Cloud is part of Ericsson’s Transport and Automotive portfolio. Is Ericsson’s focus entirely on Connected Vehicle Cloud, or are you active in development of the embedded technology in the car?

KZ: Our message is quite clear. We deliver the cloud solution that the car is connecting to. Then we are happy to work with the OEMs, Tier 1s and leading device suppliers as they design, deliver and refine the technology that is embedded in the car. Our goal is to make the cloud solution credible, and so will work very closely with these companies. We also work with Genivi, developing the way the car connects to the cloud.

VH: Is Ericsson working with more OEMs than Volvo?

KZ: Yes we are, but Volvo is the only one that we can disclose at the moment. We can talk about our work with AT&T, which has been the network operator partner for the project with Volvo in North America. It’s a complicated puzzle though! Ericsson has a partnership with Volvo and is providing it with the Connected Vehicle Cloud solution in 160 global markets, and then Volvo is working with AT&T in the US on traditional, 1.0 telematics and embedded solutions. Then, Ericsson has a separate relationship with AT&T, which is broader than just the Volvo relationship. As I said, it’s complicated!

VH: What do you see as the major challenges for the connected car and what are your solutions?

KZ: I see that the biggest problem comes from deploying a solution or service on a worldwide basis – making sure that it works globally, in all markets and guaranteeing 24/7 quality of service. That was how Volvo was different. They decided to work with one global solution from day 1 – Ericsson’s, of course – it made sense for them to let one company manage all of the cloud and back-office systems, as it would have been far too big a challenge to either do it themselves or to try to do it with different partners in every territory. Not only do we have the cloud and software expertise but we also have our managed services business where we are helping operators and other service providers to maintain their networks or other real-time data services 24/7.

VH: Does this mean in a situation like this that Ericsson connects the OEM with network operators across the world?

KZ: No, we’re not doing that. We need to stay objective as many of the operators are also our customers and so we want Volvo, or whichever OEM it might be, to choose the operators they want to work with. We can help the OEM, of course, by telling them what they should be looking for in their discussions, but at the end of the day it is up to the OEM to select the operators.

VH: How does Ericsson align with Apple CarPlay and Android for Auto?

KZ: As Ericsson is limiting itself to providing the cloud solution, and isn’t involved with the embedded technology, we don’t have any connection with those in-car operating systems. We are happy to work with the Tier 1s and other developers who are creating the gateway between the consumer devices, the in-car technology and then the connection with the outside world, but we get involved from the point where the communication is leaving the car and connecting with the Ericsson Cloud, not before. That link is created either by connecting the car via the consumer’s phone or via a pre-installed SIM in the car. In the case of the Volvo, Ericsson and AT&T deal in the USA, that uses pre-installed SIMs, and the same is true in China as well with China Unicom. Europe is a roaming area so there each dealer or customer adds the best SIM card for its market. So CarPlay and Android for Auto are really for the OEMs and Tier 1 suppliers to address.

VH: Is Ericsson looking at purely consumer solutions with Connected Vehicle Cloud, or are you also considering fleet or freight operators, telematics solutions providers, insurance companies etc.?

KZ: There is no limitation with Connected Vehicle Cloud, so we are working with B2C and B2B solutions providers and we are already providing support for a number of use cases. The cloud is optimised for integrating and exposing APIs to build solutions. That is the big benefit of the ecosystem – connecting partners.

VH: How many vehicles on the road today are connected to the Ericsson Connected Vehicle Cloud?

KZ: The number that we released at the beginning of 2015 was ‘more than 500,000’ vehicles, so while that is the published number, I suspect it is a little higher today.

VH: Is Ericsson making its technology available to prominent systems developers – is this an open platform?

KZ: The Service Enablement Platform has all the flexibility needed for Service Providers, such as OEMs, to expose APIs to application developers in an open and secure way while protecting the OEM’s core assets. However, what we still see in the automotive industry is that the OEMs prefer to keep this development in-house, working with their own developers and partners who are building their core applications, and not exposing their data to just any developer as Apple and Google have been doing. This is what used to be called a walled garden situation. I think things will stay this way for some time, with the OEMs keeping their core data to themselves and developing core applications themselves with select developer partners, and leaving it to Apple and Google to provide open developer ecosystems/marketplaces for long-tail applications. The OEMs are conscious that there are new things that they need to focus on, such as autonomous driving, and new business models, new services.

VH: Is there any legacy benefit to being part of what was once a dominant mobile and wireless systems company when working with the auto OEMs?

KZ: Certainly, our legacy has helped us a lot. Not just in connected cars, but in everything that is connected. We have a lot of assets,
a lot of experience and a lot of enablers that benefit Ericsson in this space.

**VH:** And what would you see as the next step for Ericsson?

**KZ:** Well, I think the next step for Connected Vehicle Cloud and value-added services will be to look at connecting the transportation systems with the road authorities and with the Smart Cities. That really will be the enabler for new services such as autonomous driving, car-sharing and so forth. That is where Ericsson is focussing now. You might have heard of the Connected Traffic Cloud in Barcelona. The Connected Vehicle Cloud is the platform for the OEMs. The Connected Traffic Cloud is for the road authorities and Smart Cities. Imagine a scenario in the future where a car is entering a city. The car has its own Connected Vehicle Cloud connectivity, and the city has its own Connected Traffic Cloud. This city cloud will take data from the car, and this will allow it to address issues such as traffic congestion, parking and so on. This is the next stage – connecting everything, creating a new ecosystem.

**VH:** OK, and to finish off in traditional fashion, how do you see the connected car market changing in the next 3-5 years and beyond?

**KZ:** Well, we are past connectivity 1.0, so over that period I would say it will be all about innovation, creating new services, new business models and new roles for long-established companies. The car companies are really transforming their roles, understanding that they need to think about services rather than just products. It all revolves around finding different uses of the data that cars are generating.

**VH:** Do you think this will be an easy transition, and are the OEMs ready to take on these new roles?

**KZ:** I don’t think it will be easy, and today I think we see OEMs just taking the first, small steps. But I think it needs to happen. Knowing how quickly it will happen is not easy. The only safe thing to say is that it will probably take longer than we think!

http://www.ericsson.com/ourportfolio/transport/connected-vehicle-cloud
Most high-tech Porsche yet?

Mission E concept combines OLED, eye-tracking, holography and high speed data connectivity

Porsche introduced the first all-electrically powered four-seat sports car in the brand’s history - the Mission E - at the IAA in Frankfurt. As well as looking like a completely contemporary Porsche, the concept car apparently combines ‘excellent’ performance and the ‘forward-thinking practicality of the first 800-volt drive system’.

Headline stats include over 600 hp (440 kW) system power and over 500 km driving range. All-wheel drive and all-wheel steering, zero to 100 km/h acceleration in under 3.5 seconds and a charging time of around 15 minutes to reach an 80 per cent charge of electrical energy.

But let’s focus on what is happening inside the car. The instrument cluster shows five round instruments displayed virtually in OLED technology, i.e. by organic light-emitting diodes. The round instruments are organized according to the driver-relevant themes of Connected Car, Performance, Drive, Energy and Sport Chrono. The controls are just as innovative. An eye-tracking system detects, via camera, which instrument the driver is viewing. The driver can then activate the menu of the instrument in focus by pushing a button on the steering wheel and navigate in it – which also involves an interplay of eye-tracking and manual activation. But that’s not all: the display follows the seat position and body attitude of the driver in what is known as a parallax effect. If the driver sits lower, higher or leans to one side, the 3D display of the round instruments reacts and moves with the driver. This eliminates situations in which the steering wheel blocks the driver’s view of certain key information, for instance. All relevant information such as vehicle speed is always within the driver’s line of sight.

And who says that the German manufacturers do not have a sense of fun? The Mission E can even portray driving emotions: a camera mounted in the rear-view mirror recognizes the driver’s good mood and shows it as an emoticon in the round instrument. The fun factor can be saved together with individual information such as the route or speed, and it can be shared with friends via a social media link.

Okay…

The entire dashboard is chock full of new ideas and is divided into two three-dimensionally structuring layers. The upper layer integrates the driver’s display, and between the levels there is a holographic display that extends into the passenger’s side. It shows individually selectable apps, which are stacked in virtual space and arranged by priority with a three-dimensional effect. The driver – or passenger – can use these apps to touch-free control primary functions such as media, navigation, climate control, contacts and vehicle. The desired symbol is activated by gestures that are detected by sensors. A grasping gesture means select, while pulling means control. In addition, driver or passenger can use a touch display on the centre console to control secondary functions such as detailed information menus.

The concept vehicle can also be configured externally from a tablet via Porsche Car Connect. Using “Over the Air and Remote Services” the driver can essentially change the functional content of the vehicle overnight. According to Porsche, a simple update via the integrated high-speed data module is all it takes to implement the travel guide or additional functions for the chassis, engine or infotainment system. The driver can use a smartphone or tablet to start updates from the Porsche Connect Store. Furthermore, Porsche Connect enables direct contact to a Porsche Centre for remote diagnostics or to schedule appointments. Another function of integrated Remote Services is the digital key, which can be sent via the Porsche Connect Portal. It not only lets the owner open the doors, but also other persons authorized by the owner such as friends or family. After successful authentication, the key can be used within a specific time frame and defined location.

Admittedly, this is a show/concept car, but Porsche is showcasing some innovative ideas here, and if a good proportion of them make it to production, then it will not only move the game on for electric cars (or at least drag the established motor industry a few steps nearer to catching up with Tesla), but it will also deliver a host of new infotainment, driver assistance and connected car functionality.

Although a launch date has not yet been announced, there has been a suggestion that a car such as the Mission E could be on the road in three years.
BENTLEY SUV PACKS IN TECH

Bentley Motors unveiled its Bentayga SUV at the 66th IAA in Frankfurt, describing the car as ‘combining unparalleled luxury with effortless performance and everyday usability’. The Bentayga introduces a suite of driver assistance technologies and its on-board infotainment systems are also all-new. Bentley describes the Bentayga as an innovative, advanced and connected car.

The core of the new system is an all-new touch screen-based infotainment platform with additional haptic controls, classic analogue gauges, rear seat entertainment and a touch screen remote control for rear climate comfort. The main 8” display touch screen is connected to a 60 GB solid-state hard drive for the storage of on-board media.

The rear seats and climate comfort are controlled via the Bentley Touch Screen Remote – a handheld, smart-phone-sized device with a 3.5” touch screen that allows access to rear seat systems.

The Bentayga also introduces the new Bentley Entertainment Tablet. When Rear Seat Entertainment is specified, the car comes with a pair of removable tablets that are connected to the car via on-board 4G Wi-Fi. The Android-powered tablets feature a Bentley-specific interface and access to over a million Android Apps, and can be used away from the car, in the office and at home. Each tablet has a 10.2” full HD display, has 32 GB of on-board storage (expandable to 128 GB via a Micro-SDXC card), USB ports and a front-facing camera. The tablets fit into holders installed to the backs of the front seats, and can be connected via Bluetooth to wireless headphones. Audio can also be streamed through the vehicle speakers, and new destinations can be sent from the tablets to the Bentayga’s navigation system. Internet browsing is via the car’s 4G Wi-Fi system, permitting access to internet radio and local or streamed video.

Three different audio configurations are available. The standard sound system of ten speakers and six channels can be upgraded to the Signature system, consisting of 12 speakers, 12 channels and a 700 watt amplifier.

The top-level on-board audio system is the Naim for Bentley Premium sound system, featuring 18 speakers, 19 channels, a 1,950 watt amplifier and Super Tweeters.

In addition to these options, the Bentayga is available with what Bentley says is its widest ever range of lifestyle accessories. For example, customers with an interest in watersports may wish to specify the Load-Assist Tray and Wet Gear Stowage options. Naturally!

BMW UPDATES MINI CONNECTED APP

After five years on the road, the Mini Connected app is undergoing a major relaunch, the new version having become available to download from mid-August. BMW told Connected Car that the new and updated features include: Mini Streetwise, the basic functions Status, Apps and Profile, Online Search, Sports Instruments, Force Meter and Calendar.

Mini Streetwise is the new central feature of the Mini Connected app. It lets users display the best route on their smartphone before the journey has even started. The app makes use of personal driving data together with the user’s own past journeys and shows information such as journey duration and fuel consumption. The app determines the current location and displays all destinations recorded to date and the best routes on the smartphone. If several drives to the same destination have already been recorded, Mini Streetwise will calculate the user’s personal best route as the recommended option.

Clicking on the destination pin calls up the estimated time of arrival together with alternative routes, including data such as distance, journey duration and fuel consumption. Users can choose to have the places displayed on a map or as a list. This same information can also be displayed in the Centre Instrument once the smartphone has been connected to the Mini. Drivers therefore always have a clear recommendation for the best way to get from A to B.

In addition to Streetwise, the vehicle’s location, fuel level, potential range and last journey recorded can be found under the menu item “Status”. Clicking on the location opens a map view showing the route to the parked car. All available and installed apps are listed under “Apps”, providing users with a quick summary of all the applications that can be used in the vehicle via Mini Connected. This includes the third-party apps that are available for their Mini in the App Store or that are already installed on the smartphone and linked to the vehicle. In addition to this is the “Profile” menu item, where users can enter a name for themselves or their Mini, upload a photo and call up their personal driving statistics.

Connected Car

NEWS
# NextGen

## TOP HANDSET RELEASES BY REGION – Q4 2015

### EUAPE Q4

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>iPhone 6S</td>
</tr>
<tr>
<td>Apple</td>
<td>iPhone 6S Plus</td>
</tr>
<tr>
<td>Honor</td>
<td>7 PLK-L01</td>
</tr>
<tr>
<td>HTC</td>
<td>Desire 626</td>
</tr>
<tr>
<td>Motorola</td>
<td>Moto G 3rd Generation XT1541</td>
</tr>
<tr>
<td>Motorola</td>
<td>Moto X Play XT1562</td>
</tr>
<tr>
<td>Motorola</td>
<td>Moto X Style XT1572</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy S6 Edge+ G928F</td>
</tr>
<tr>
<td>Sony</td>
<td>Xperia Z5 Compact E5823</td>
</tr>
<tr>
<td>Sony</td>
<td>Xperia Z5 E6653</td>
</tr>
</tbody>
</table>

### NORTH AMERICA Q4

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>CARRIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>iPhone 6S</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Apple</td>
<td>iPhone 6S</td>
<td>Verizon</td>
</tr>
<tr>
<td>Apple</td>
<td>iPhone 6S Plus</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Apple</td>
<td>iPhone 6S Plus</td>
<td>Verizon</td>
</tr>
<tr>
<td>Motorola</td>
<td>Moto G 3rd Generation XT1540</td>
<td>T-Mobile</td>
</tr>
<tr>
<td>Motorola</td>
<td>Moto X Pure Edition</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy Note5 N920A</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy Note5 N920V</td>
<td>Verizon</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy S6 Edge+ G928A</td>
<td>AT&amp;T</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy S6 Edge+ G928V</td>
<td>Verizon</td>
</tr>
</tbody>
</table>
### CHINA Q4

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apple</td>
<td>iPhone 6S</td>
</tr>
<tr>
<td>Apple</td>
<td>iPhone 6S Plus</td>
</tr>
<tr>
<td>Huawei</td>
<td>Mate S</td>
</tr>
<tr>
<td>Huawei</td>
<td>P8 Max</td>
</tr>
<tr>
<td>Meizu</td>
<td>Pro 5</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy Note5 N9200</td>
</tr>
<tr>
<td>Samsung</td>
<td>Galaxy S6 Edge+ G9280</td>
</tr>
<tr>
<td>Xiaomi</td>
<td>Mi 4c</td>
</tr>
<tr>
<td>Xiaomi</td>
<td>RedMi Note 2</td>
</tr>
<tr>
<td>ZTE</td>
<td>Axon天机</td>
</tr>
</tbody>
</table>

### JAPAN Q4

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>CARRIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>au</td>
<td>Apple</td>
<td>iPhone 6S</td>
</tr>
<tr>
<td>au</td>
<td>Apple</td>
<td>iPhone 6S Plus</td>
</tr>
<tr>
<td>au</td>
<td>Kyocera</td>
<td>Torque G02</td>
</tr>
<tr>
<td>au</td>
<td>Kyocera</td>
<td>Urbano V02</td>
</tr>
<tr>
<td>docomo</td>
<td>Apple</td>
<td>iPhone 6S</td>
</tr>
<tr>
<td>docomo</td>
<td>Apple</td>
<td>iPhone 6S Plus</td>
</tr>
<tr>
<td>docomo</td>
<td>Sony</td>
<td>Xperia A4 SO-04G</td>
</tr>
<tr>
<td>Softbank</td>
<td>Apple</td>
<td>iPhone 6S</td>
</tr>
<tr>
<td>Softbank</td>
<td>Apple</td>
<td>iPhone 6S Plus</td>
</tr>
<tr>
<td>Softbank</td>
<td>Sony</td>
<td>Xperia Z4 40250</td>
</tr>
</tbody>
</table>
CONTINENTAL SUPPORTS TOYOTA WITH MULTI-FUNCTION CAMRA AND LIDAR

Continental has developed a new integrated sensor module, Multi Function Camera with Lidar (MFL), by integrating a camera and an infrared Lidar (Light Detection and Ranging Sensor) into a single compact unit. According to Continental’s announcement, the module is now being supplied to Toyota for its new active safety package, “Toyota Safety Sense C” for compact cars.

Continental told Connected Car that MFL represents a key driver-assisting technology to support its Vision Zero goal of accident-free driving, including no fatal accidents on the road, no injuries and ultimately, no accidents.

Samir Salman, CEO Continental North America commented, “We are proud to be the supplier of this module to Toyota, taking a big step towards Vision Zero. With its three Continental-supplied active safety technologies - Pre-Collision System (PCS), Lane Departure Alert (LDA) and the Automatic High Beam (AHB) - the Toyota ‘C-Package’ equipped vehicles make a significant contribution to driving safety and reduction of accidents, helping to move towards the realization of Vision Zero.”

The Multi Function Camera with Lidar integrates two sensor technologies. By combining the strengths of a camera with those of an infrared Lidar, the new sensor module is able to detect objects ahead of the vehicle and can warn the driver of a possible collision with an audio and visual alert. If the driver fails to brake in time, the system automatically applies the brakes. Up to approximately 50 mph, a crash can be completely avoided if the relative speed to the detected object is less than 30 mph. If the speed differences are greater, emergency braking will considerably reduce the force of impact.

CMOS (Complementary Metal-Oxide-Semiconductor) cameras are already used for identifying objects in front of a vehicle. However, Continental believes that a CMOS camera alone cannot always provide completely reliable information for initiating automatic emergency braking. Lutz Kuehneke, North American head of Continental’s Advanced Driver Assistance Systems business unit explained, “The Lidar sensor transmits three pulsed infrared beams with a 905nm wavelength and measures the time-of-flight until the reflected beams reach the receiving optics.” The sensor monitors a distance of more than 30 feet in front of the vehicle, which classifies it as a short-range Lidar system. From the speed of light and the time-of-flight, the Multi Function Camera with Lidar is able to calculate the distance to the object to an accuracy of about four inches. In conjunction with the CMOS camera, the sensor module provides reliable means of object categorization.

BOSCH IS TEACHING THINGS TO FEEL

Although they are only as small as a pin head, they are changing everyday life in many fields: tiny micromechanical sensors. In cars, sensors identify dangerous situations and instantly alert the control electronics to keep the vehicle on the road. Because sensors detect the earth’s gravity, smartphones can change their screen orientation to suit users’ needs. “The key challenge in the ongoing development of our MEMS sensors is their energy consumption. For example, more intelligence in sensors makes it possible for us to reduce energy consumption,” Dr. Franz Lärmer, a Bosch sensor expert told Connected Car. “It is hard to put a number on the many potential applications of sensors. They are a key technology for the internet of things (IoT).”

With the aim of reducing sensors’ energy consumption, Lärmer and his team in Remlingen, Germany have joined forces with Bosch researchers in Palo Alto, California. “In the future, nearly all everyday objects are likely to be equipped with sensors. This is a revolutionary development that will allow almost every object to gather information about itself and its environment. As a result, the potential applications of these objects will increase tremendously,” Lärmer said. “But other things are also playing an increasingly important role, such as the combination of several sensors and the integration of software intelligence.”

Microscopically fine structures are etched into silicon during MEMS production. On the sensor, the teeth of tiny comb-like silicon structures intermesh. Less than one-quarter the thickness of a human hair, these comb-like structures are pushed up against each other during movement. The distance between the teeth changes, leading to a change in the electric current in the structures. This current can be measured and calculated as an electric signal that the sensor then transmits. MEMS sensors are extremely sensitive thanks to this technology, Lärmer explained. “In a laboratory, you can use them relatively easily to measure the earth’s rotation. “What is more, the fine silicon structures are already capable of measuring movements of just one femtometer. This is the unimaginably small distance of 0.000000000000001 meters (10^-15 meters), the same magnitude as the diameter of atomic nuclei.
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.

2015

2-3 November 2015
TU Automotive Europe
ICS International Congress Centre, Stuttgart, Germany
http://www.tu-auto.com/europe/

17-19 November 2015
Connected Car Expo / LA Auto Show
Los Angeles, California, USA
http://connectedcarexpo.com/

18-19 November 2015
Internet of Things World Forum 2015
London, UK
http://iotinternetofthingsconference.com/connected-car/

2016

6-9 January 2016
Consumer Electronics Show
Las Vegas, Nevada, USA
http://www.cesweb.org/

27-28 January 2016
Connected Driver
Brussels, Belgium
http://www.connectedriver.events/

3-13 March 2016
Geneva Motor Show
Geneva, Switzerland
http://www.salon-auto.ch/en/

26-29 April 2016
Automotive Steering Technology 2016
Steigenberger Hotel, Berlin, Germany

8-9 June 2016
TU Automotive USA
Detroit, Michigan, USA

28 June - 1 July 2016
Connected Cars conference
Olympia Grand, London, UK
http://connectedcarsworld.com/about/