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Waymo's tie-up with Daimler Trucks could create a self-driving powerhouse

HERE Technologies' CEO offers his take on the power of location data | **Lynk & Co** puts peer-to-peer vehicle-sharing at the heart of its offering | An inside look at **SEAT's** electromobility Learning Center | The **5GAA's** Chief Technical Officer shares his view on vehicle connectivity and smart cities

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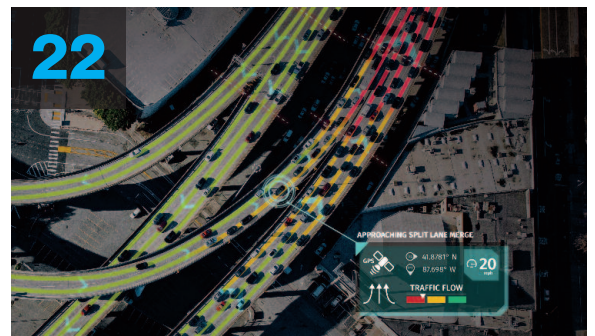


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Waymo's tie-up with Daimler Trucks could create a self-driving powerhouse

The partnership comes despite Daimler's previous announcements it would build its own system. However, the venture will prove extremely valuable for both companies. By Xavier Boucherat



© Daimler

It is difficult to understate the potential significance of the new Daimler-Waymo tie-up, which will see the Google-owned developer's self-driving technology integrated into a new Freightliner Cascadia.

An agreement between the world's biggest truckmaker and what many perceive to be the leading authority on autonomous vehicles (AVs) is a big deal by anyone's standards. However, what makes the partnership particularly fascinating is Daimler's previous position on autonomous trucks, and the apparent side-lining of previously announced projects.

New plan?

The truckmaker unveiled its autopilot-equipped 'Inspiration Truck' concept back in 2015, and in 2019 it announced the acquisition of Torc Robotics, a Virginia-based self-driving tech developer. At the time,

Daimler Trucks executive Martin Daum called the deal an "ideal combination between Torc's expertise on agile software development, and our experience in delivering reliable and safe truck hardware." The Daimler Trucks Autonomous Technology Group emerged, a dedicated wing for self-driving research which just last September announced it would expand testing to New Mexico with a new testing centre in Albuquerque.

As such, this latest announcement has caught the industry somewhat off guard. "I was a little surprised," said Jean-Dominique Bonnet, Principal Consultant, Commercial Vehicles, Frost & Sullivan. "Between the Torc acquisition and the launch of its own autonomous technology division, it looked as if Daimler had everything it needed. The fact they are now partnering with Waymo would indicate the company did not feel it was up to speed with the competition."



Daimler Trucks has shown off Freightliner models with autonomous capabilities in the past, but a new partnership with Waymo doubles down on Level 4 technology



The attraction of Waymo is easy to understand: to date, the company has completed 20 million miles of testing on public roads, and a further 15 billion in simulation. It even has experience with trucks, having previously partnered with Peterbilt for limited testing. Pedro Pacheco, Senior Director Research, Automotive and Smart Mobility at Gartner, points to statements made to German press in the days leading up to the announcement which indicate quite clearly what was coming, and what is at stake.

“Daimler concluded that in order to achieve success in Level 4 autonomy and beyond, it would need a strong technology partner,” he says. “This is a very important statement, as it

comes from one of the most technologically-advanced OEMs. For them, it’s an opportunity to partner with a tech company which will definitely accelerate a Level 4 truck’s time to market.”

Sam Abuelsamid, Associate Director, Transportation at Guidehouse Insights, added that whilst Daimler’s own internal developments will likely continue, the partnership will give it increased flexibility on the market. “It will be able to sell trucks to customers who prefer the Waymo Driver system,” he said. “What’s more, by developing a version of the base truck that is already equipped for automated system installation, they also have a product to offer other AV developers just as FCA does.”

By this, Abuelsamid is referring to Waymo's agreement with FCA in the passenger car segment. The pair have developed an AV-ready Pacifica Hybrid which has been sold to developers including Voyage, AutoX, Aurora and more. In the same way, AV-ready trucks will be of interest to Kodiak, TuSimple and other self-driving truck developers: companies which risk being left behind without access to a complete vehicle.

What's in it for Waymo?

The opportunities for Daimler are clear, but what does Waymo get out of this agreement? Increased opportunities in the trucking space have been on the company's radar for some time, with Chief Executive John Krafcik making his optimism known. In 2019, he told reporters that trucks could be among the first applications to reach public roads.

"Where uses are strictly commercial and where we have very high confidence of delivering outcomes that our commercial business partners would desire, we could have a much quicker ramp," he said. "So, it could be that although we're starting with robotaxis, a truck product could catch on faster."

"This could be a great way for the company to take leadership in the heavy-duty AV space," said Pacheco. "There is much that is complementary between the two, which is promising for future results. Even though autonomous trucking presents a sounder use case from an economic standpoint, Level 4 trucking applications have lagged, and so this partnership could help trucking achieve the prominence it needs."

Bonnet agrees that this is by no means a one-sided relationship. "There are so many things you need to bring



together to create a self-driving truck,” he said. “Of course there is the self-driving stack, and this is something that Waymo probably does best. But in terms of getting that intelligence to move that truck, whether steering or controlling the engine, that’s what Daimler can do. Both parties will do what they are good at, and for Daimler, that’s vehicle dynamics.” The question of whether truckmakers could be reduced to the status of contract manufacturers might loom large for the incumbent brands, but it is clear that they have expertise which those outside the industry lack.

Abuelsamid stresses that the partnership, much like Waymo’s relationship with FCA, will allow for system-wide optimisation that will bring down costs for the developer. “FCA worked with Waymo to understand the automated driving system,” he explained. “The automaker made changes to areas like the wiring harness, to facilitate installation of Waymo’s hardware. Subsequent iterations also added redundancy for areas such as power supply and actuation systems, which is a requirement for safe automated vehicles.”

These changes are then integrated into production by FCA, easing the retrofit process for Waymo. In the same way, the company will now have access to a Class 8 truck with similar modifications. This will improve reliability and ultimately be cheaper than individually rigging conventional trucks.

The question now is how long before trucks arrive on the road. As things stand, it is Waymo’s driverless taxi service in Phoenix, Arizona that grabs the headlines. This latest partnership could change all that in the years ahead.

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Between the Torc acquisition and the launch of its own autonomous technology division, it looked as if Daimler had everything it needed. The fact they are now partnering with Waymo would indicate the company did not feel it was up to speed with the competition

INTERVIEW:

Alain Visser, Chief Executive, Lynk & Co

In an appeal to younger, tech-savvy urbanites, the Geely-owned brand has put peer-to-peer vehicle-sharing at the heart of its offering. By Xavier Boucherat

Up till now, Lynk's place in the Geely family—and how it would operate alongside the likes of sister companies Volvo and performance brand Polestar—wasn't necessarily obvious. This changed with the online European launch of its O1 SUV: Lynk, it seems, will explore new business models for the group, including subscription models and peer-to-peer rental between owners and others.

In Europe, the O1 will be available to buy outright, like it has been in China. But in addition, the vehicle will be available on a subscription basis for €500 (US\$574) a month. Once

delivered, a subscriber will be able to rent out their vehicle to others, at a price they set. In theory, says the company, a subscriber can actually profit from a Lynk subscription.

There will be no trim options, and buyers will be faced with just two choices: colour—black or blue—and engine type, with standard hybrid and plug-in hybrid electric (PHEV) models available. Volvo has played a sizeable part in the O1's creation, with the SUV sharing a platform with the XC40.

Chief Executive Alain Visser spoke to *Automotive World* about the venture, and how he sees customers taking control of the rental process.



Image courtesy of Lynk & Co

Automotive World is exploring how the Airbnb model could work in the automotive industry. In considering the Lynk model, do you think Airbnb is a fair comparison?

Yes. Often I make comparisons with Spotify and Netflix, but given the value of the asset, Airbnb is probably better. It's important to note that unlike some other shared mobility ventures, our business model is based on membership, which allows monthly use of the vehicle. The sharing element has been introduced for two reasons. First, it allows our members to reduce costs. Second, it drives up utilisation of the vehicle, and improves sustainability.

How do you think sharing will work on a practical basis?

I see three main scenarios. In the first, a subscriber signs up for a car, and shares it with anyone out there who wants it. This will be limited in the beginning, as the number of cars on the road will be small: Lynk is not going to flood the streets with vehicles in the way kick-scooter companies have, for example.

In the second scenario, which will be more relevant as we start out, we can imagine a group of people sharing the price of a membership among themselves, such as three or four friends. They can then share the vehicle. In the third scenario, a company might replace its company cars with a fleet of Lynk vehicles, which can then be shared among employees.

The European launch of the O1 put sharing at the heart of the brand. How has the vehicle itself been built with sharing in mind?

Most obvious of all is the integrated sharing button, found on the central console screen. The O1 is one of the only cars in the world to feature something like this: it's not an add-on, and doesn't require any additional software or hardware. Even people with no plans to share their vehicles will have the option. And then the second thing I'd draw attention to is the ergonomics of the vehicle, and its brutal simplicity. There's not too many buttons, and even someone who's never driven a Lynk before will have no problems. There's no need to consult a user manual.

Sharing your car with a stranger will be a worrying prospect for many. How do you put their minds at ease?

Indeed, it's the same issue we see in the Airbnb market itself: you want to make sure you take your asset back in the same condition you gave it. There are three important elements here. First is insurance, which covers three parties, namely the borrower, the lender and the vehicle itself. Secondly, there will be a camera-based system that checks the vehicle before and after use. Lastly, lenders and borrowers will be given a rating in the same way Uber drivers and riders are. And so anybody who does return a vehicle in a bad condition can be thrown off the app.

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If anybody makes money out of sharing, it should be the person who owns the car, and not us. That is what will make our business model work, and it's a very different approach to what we have seen so far



You mention insurance, which is a new and interesting challenge in itself. What else can you tell about that?

Lynk has brought in experts from the auto insurance industry to work on this. It is one of the topics that has required the most work, because as you say, it is relatively new and quite complicated. However, we already see that the insurance industry is adapting to sharing models, because shared mobility is becoming the new normal. Insurance companies are willing to get involved and learn, because they understand that this is going to start happening everywhere. This means we can offer coverage across three parties as part of the membership, at no extra cost.

What are some of the challenges in establishing a viable peer-to-peer sharing business?

What's important to understand is that Lynk does not want to make sharing a direct part of its own business model: we recover costs through membership. Profit from sharing is for the borrower, and represents a business case for him or her to reduce their costs. The market has already proven that it is extremely difficult to get a viable sharing company up and running, and so our own path to viability will not rely on betting everything on sharing. Even if none of our members ended up sharing their vehicles, we would still expect to be profitable, because it's not where we make the money.



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The 01 is one of the only cars in the world to feature an integrated sharing button: it's not an add-on, and doesn't require any additional software or hardware. Even people with no plans to share their vehicles will have the option




In short, if anybody makes money out of sharing, it should be the person who owns the car, and not us. That is what will make our business model work, and it's a very different approach to what we have seen so far.

Beyond the convenience of the car and sharing opportunities, I would mention that an important part of the business model will be to create an exciting brand experience. And so there will be a whole dimension around events that our members will be able to take part in, organised around our clubs. We will not have dealerships: we will have hubs, where we can do business and reach out to our members, who can share experiences with us in line with our sustainability message.

Can you give me a rough idea of how you'll ramp up the business, and how many vehicles you hope to have on the road in the next few years?

As this is a new business model, it's extremely difficult to accurately forecast volumes. But in Europe, our assumption is that in our home town of Gothenburg, we will have between 200 and 500 members by the end of 2021. Cities are the main target: a business model that sees vehicles parked for 96% of the time is an incredibly non-sustainable one, and a model like Lynk's could make a big difference. But this will depend in equal part on our customers: if they decide not to share their cars, it's not going to make a huge difference in that respect. And so it's something of a joint effort.



Is this the blueprint for a pandemic- resistant vehicle?

Interiors that address the needs of society's most vulnerable promise a step change in accessible mobility. By Megan Lampinen



Travel patterns and mobility preferences changed dramatically in the wake of the novel coronavirus (COVID-19). By the end of March 2020, global road transport activity almost halved from 2019 levels according to the International Energy Agency. Public transport and shared mobility were some of the hardest hit sectors, as many travellers were put off by contagion concerns, and those who could returned to the perceived safety of their own vehicles.

But such a shift is not sustainable and work quickly began on ways to make shared vehicles—be it buses or Ubers—safer for passengers. Booking apps to manage limited capacity in buses proved a popular near-term step, along with the introduction of a physical partition between passengers and drivers in ride-hailing schemes. Removing the driver altogether goes even further towards reducing the risk of contagion, and many players believe that autonomous driving could indeed be the way forward. The Chief Executive of robotaxi operator Voyage claims that its third generation model is “COVID-ready”, thanks in part to the elimination of a human driver and the use of ultraviolet-C (UV-C) light which, correctly applied, can eradicate infectious viruses on surfaces or in the air.

These are all helpful steps but so far work has taken place in silos without any sort of industry-wide stance. That is, until now. In the UK, two local organisations have teamed up to develop general design guidance for pandemic-resistant self-driving vehicles for shared use cases. The guidance focuses specifically on the interior of vehicles, where health concerns are centred. Zenzic, an

organisation dedicated to accelerating autonomous driving, and self-driving company Aurrigo believe their recommendations could serve as the foundation for the development of an industry-wide set of official design guidelines.

A new foundation

“We believe this is the first time guidance has been issued broadly for self-driving vehicle design, although many of the features and steps outlined would also work in other types of vehicles from buses to trains,” explains Zenzic Chief Executive Daniel Ruiz. “We feel it is important to have industry specific guidance as self-driving vehicles have shown great promise in supporting the safe movement of people and goods during the pandemic.”

Most industry players agree that Level 5 autonomous vehicles (AVs) with no geofenced limitations are still years away, but development work on those designs needs to begin now. The authors of the UK’s *Connected and Automated Mobility Roadmap to 2030* specifically advise that designs of AVs need to be finalised by 2024 in order for the UK to fully benefit from the widespread use of AV services by 2030. Ruiz backs this up: “While we are still about ten years away from the widespread introduction of self-driving vehicles on our streets, we need to make sure that any vehicles which are being designed today have systems built-in from the off which keep their interiors clean and safe. This way, if we do have to go into lockdown again in the future, we will be able to deploy self-driving vehicles straight away to support key workers and vulnerable people.”

The Voyage G3 uses ultraviolet light to deactivate pathogen DNA, halting reproduction cycles of viruses, fungi and bacteria



And this design guidance is all about the vulnerable. The elderly are predicted to be early adopters of AVs, which could offer them an easy way to remain independent and mobile after they can no longer drive themselves. Voyage focuses squarely on this demographic with its robotaxi service, which runs in retirement villages. However, this demographic is also more vulnerable to viruses like COVID-19, so getting the safety angle right is pivotal. “The guidance is specifically built around the requirements for self-driving vehicles to cater for vulnerable users, a group which includes those with conditions that make them susceptible to respiratory illnesses,” emphasises Ruiz.

Practical steps

So, how does one design a vehicle interior to reduce the risk of contagion? The guidance drawn by up Zenic and Aurigo suggests that interiors should be large enough to incorporate a minimum distance of 1.5 metres between pairs of seats to maintain social distancing. Notably, these COVID-proof vehicles will need to be pretty large in order to provide that sort of interior space. The document specifically recommends enough seating for ten passengers, which would also make sure the vehicles won't be exacerbating urban congestion and emission problems.

The elderly are predicted to be early adopters of AVs



Other recommendations include the installation of hand sanitiser dispensers near the door and Plexiglass safety screens to reduce the transmission of air between different zones of the vehicle. Contactless payment and automatic door-opening will reduce the number of contact points during the customer journey. HVAC systems should be fitted with mechanisms to filter the air and remove viruses and other pathogens from recirculated airflow, such as with HEPA filters or UV surface treatment. The guidelines also stipulate that vehicles should be able to facilitate airborne means of cleansing, such as using ozone while the vehicle is empty.

Much of these recommendations stem from the UK's Connected and Automated Mobility Roadmap to 2030, Aurrigo's experience in developing its self-driving shuttle and work published

by the Royal Academy of Engineering around the mitigation of the risk of COVID-19 transmission on public transport.

A different perspective

The full guidance document contains a mix of both small- and large-scale design changes for automotive companies, though Ruiz believes the costs involved "don't have to be too high." As he explains: "We want the guidance to provide a basis for self-driving vehicle designers to adopt a different perspective when considering the design of their vehicles. It is true that retro-fitting more complex HVAC or airborne cleaning systems could become costly. However, the hope is that by opening up this conversation now,

Continental has developed a partition panel made of plastic film for passenger car interiors that protects drivers and passengers against COVID-19 during transport



and encouraging the industry to share their findings and collaborate, these design changes can be brought in at an earlier stage of the design process. Ideally they would become a natural part of the connected and autonomous vehicle design workflow.”

The guidelines could also be adapted for human-driven vehicles. The main difference between these and AVs is that the latter can have a more flexible layout than the former, which require a driver in the front. “We see the guidance more as building on the best practice of human-driven vehicles and taking advantage of the unique benefits of a self-driving vehicle, rather than having to adapt the other way round,” he clarifies.

While this document is designed to guide developers, it is in no way a regulation. Whether it becomes so down the line is another question. “We work closely with government and with organisations like BSI, so we

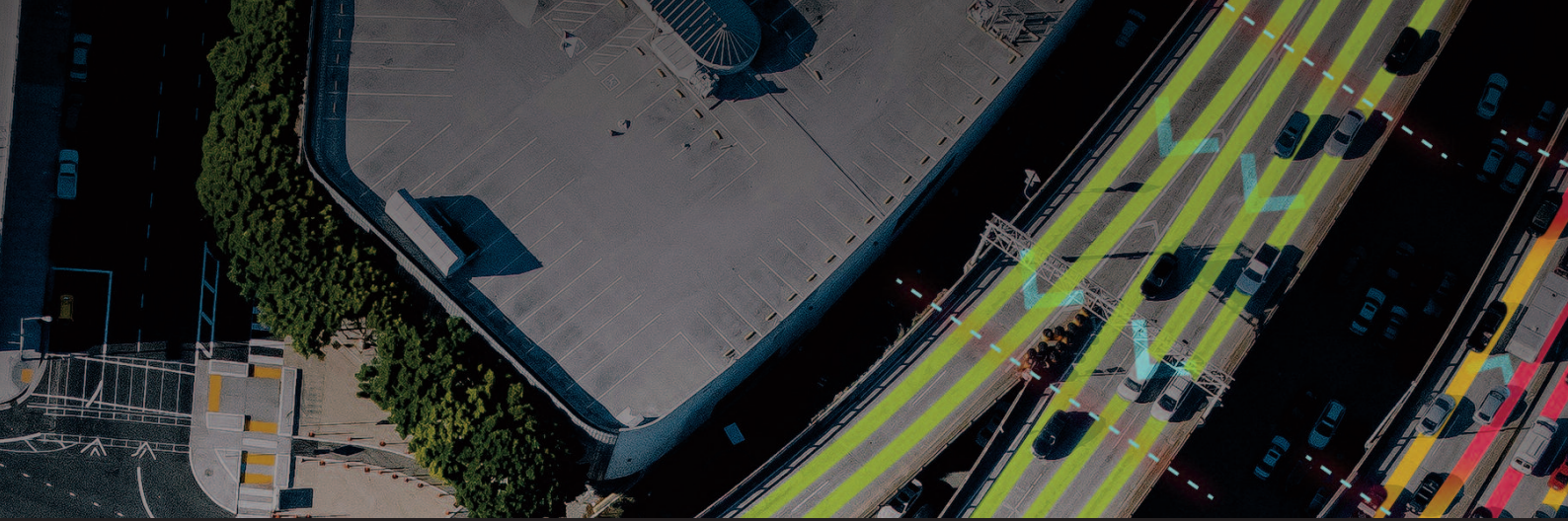
understand the importance of regulation and legislation,” says Ruiz. “The development of these systems is still at a very early stage, but regulation will be part of the discussions raised by the guidance and necessary steps will be taken to ensure adequate public health safety measures are put in place.”

Beyond COVID

The design changes put forward in these guidelines were inspired by the immediate issues raised by the COVID-19 pandemic, but they remain relevant even in a future in which there is an effective vaccine. After all, improved air circulation, the presence of hand-sanitisers and automated cleaning systems could also tackle the transmission of flu or colds. “We have an opportunity with self-driving vehicles to consciously design them to cater to more

people than existing public transport and other mobility services provide,” he adds. “If implemented, self-driving vehicles would offer immunocompromised people access to transport options that may have been too high-risk for them previously. We think that’s worth doing.”

This guidance is targeted at anyone designing an AV but it’s just the start of what will prove a longer journey towards more accessible mobility. “Our aim is for this to kick-off a discussion in the industry around how self-driving vehicles can be made safer in pandemic scenarios, and how we can use this as an opportunity to make it more difficult for infections to be transmitted in shared-use vehicles,” says Ruiz. “We are calling for a change in approach to design rather than suggesting all self-driving vehicles require dramatic redesigns.”



“Location data at the very beginning of its journey,” says **HERE CEO**

Edzard Overbeek explores some of the more promising markets and use cases for location data.
By Megan Lampinen

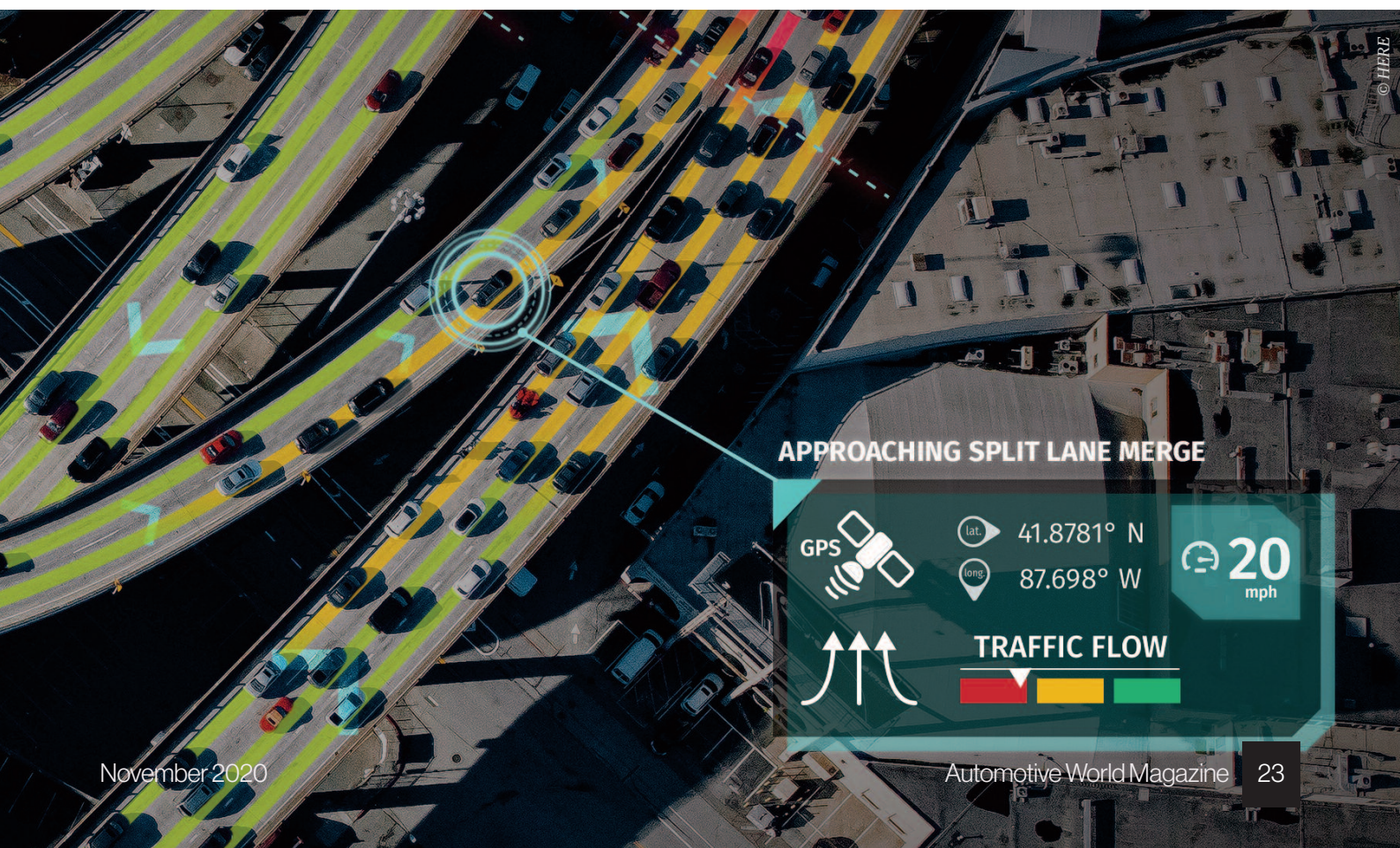
Location data specialist HERE Technologies is powering ahead in its transformation from a mapping provider to a location platform company. Despite the current economic uncertainty and lingering health concerns in the wake of the novel coronavirus (COVID-19), HERE believes location data remains more important than ever for players across the mobility ecosystem. People, businesses and cities are tapping into the power of local intelligence to optimise all sorts of services, from infrastructure and asset management to vehicle navigation and logistics.

A data stock market

If data is indeed the new oil, then HERE is rolling in black gold. The first use case for this data was navigation, and today, the HERE map database contains around 57 million kilometres of roadways that connect 125 million points of interest in more than 200

countries. It has access to 84,000 sources for data sets worldwide, both dynamic and static, including local entities, public transport providers and government feeds. Every day HERE's database ingests about 7 billion points of probe data, coming in from millions of vehicles with its embedded navigation solution as well as from automaker partners with which it has sensory data agreements. According to Chief Executive Edzard Overbeek, this is just the start. "Location data is at the very beginning of its journey," he asserts.

A big part of HERE's current focus is on its Marketplace product, a neutral and scalable platform for the exchange of location-based data and a key element of HERE's cloud-based Open Location Platform. Numerous automotive industry players have joined the Marketplace, and at some point members could have access to each other's data to enrich their own services.



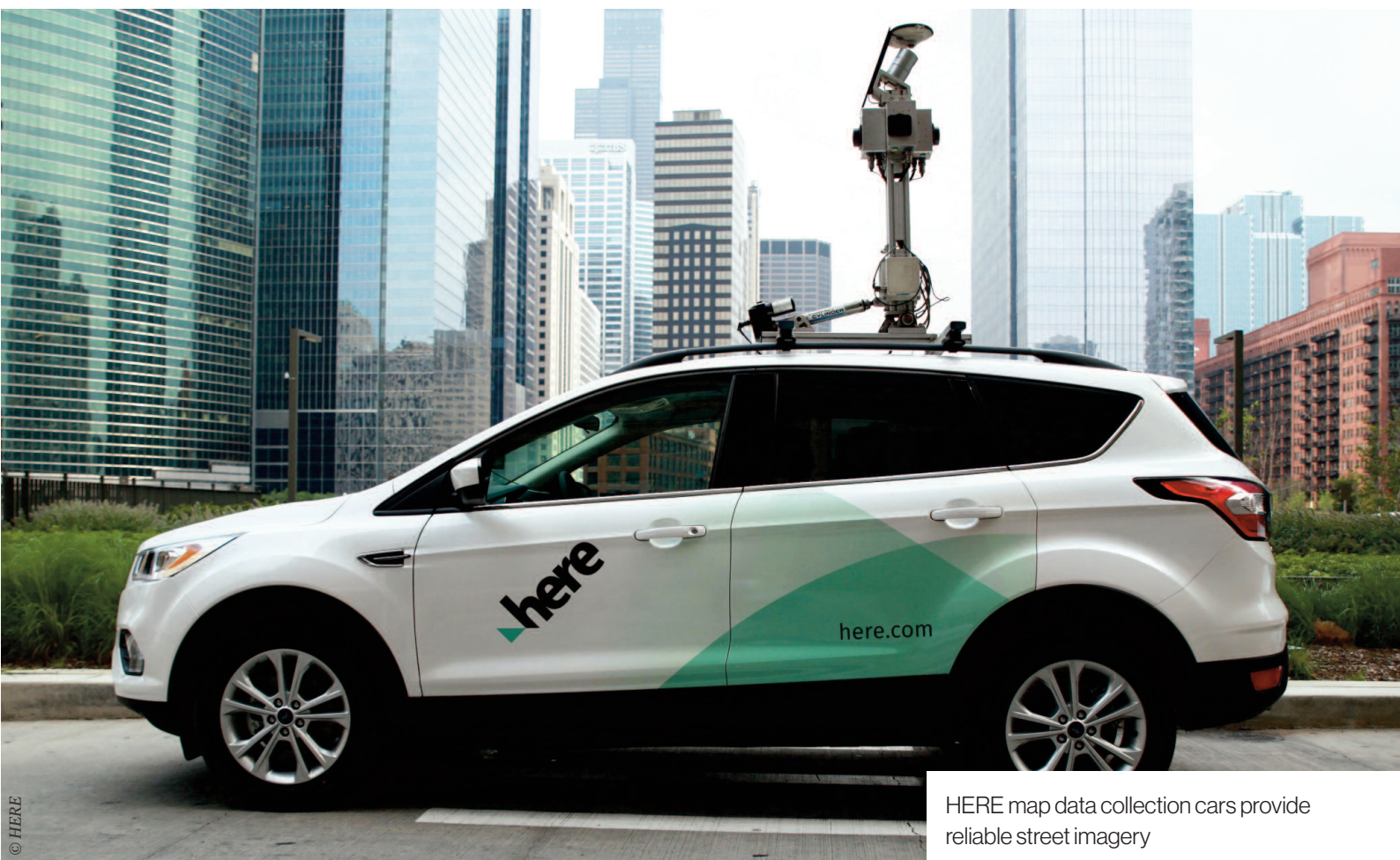
“We don’t have this activated yet, but the technology is there to do it. This level of location data exchange is something we are exploring,” said Overbeek. “We want to become a stock market where you have buyers and suppliers, and basically it will sort itself out. The better the data is, the more they will transact with each other.” HERE, which provides the platform, will receive a fee linked to these transactions.

Indoor mapping

Location data doesn’t just mean roadways; HERE has big plans for mapping the inside of buildings. “The indoor space is a very strategic one for us,” Overbeek tells *Automotive World*. The company is using high definition Wi-Fi, high definition Bluetooth, and

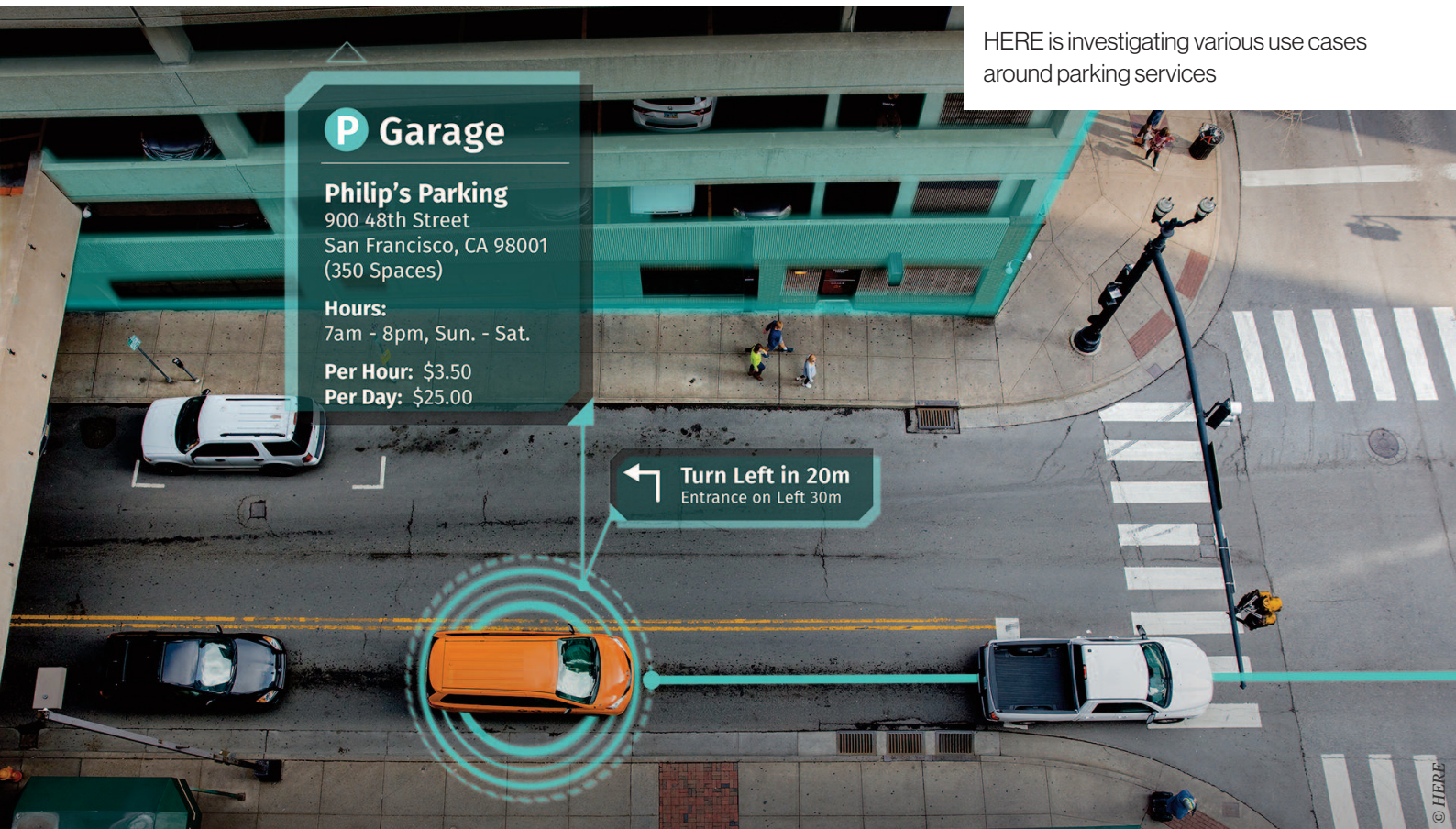
other sensing equipment to map internal spaces at centimetre precision. That is important, because for applications around targeted advertisements or pure location-based services using augmented reality, one needs to understand where people and things are and how to best represent that digitally for users.

HERE has already started to deploy these high definition indoor maps in major cities, concentrating on commercial companies that want their buildings mapped, and the public sector. “Think of airfields, airports and railway stations—we do all of these,” he says. “Our objective over the next couple of years is to have all of the major cities indoor-mapped where possible and then to make that available to our customers through the platform.”



HERE map data collection cars provide reliable street imagery

HERE is investigating various use cases around parking services



Indoor mapping could also prove relevant to the mobility sector through applications such as indoor parking. This is an opportunity which HERE is exploring through a number of collaborations with parking companies. One of the more recent announcements involves a partnership with European parking management company APCOA, with which it will map its parking garages, in three-dimensional high definition. The end game is to serve the use case of valet parking. Imagine stepping out of the car at the beginning of the parking garage and pushing a button that will automate the whole process. The vehicle parks itself and later cashes itself out through the tollgate when the owner returns for it.

With promising use cases like these, the supplier has boosted its headcount in this area with

individuals from other industries. “We want to make sure that we have the right subject matter expertise in there,” adds Overbeek.

Japan offensive

While HERE’s roots are in Europe, its ambitions are truly global and a big focus at the moment is on Asia, particularly Japan. Before the 2020 Olympic Games in Tokyo was postponed due to COVID-19, HERE was working on a project to provide a full three-dimensional map overview of the Olympic space. While these plans are temporarily on hold, other projects remain on the go, including location services for Japanese consumers.

HERE already offers a localised navigation platform for the Japanese

HERE and IPC both develop high definition (HD) mapping for automated vehicles



market, providing instruction sets in Japanese and in English. “We have started to migrate our services with the help of our strategic partner, Increment P Corporation (IPC), to have access to local map data. We enrich that with our tooling and our systematic approach, and then add the HERE quality on top of those maps for Japanese customers,” explains Overbeek.

The company has had “multiple conversations” with local players around the HERE WeGo city navigation app, and Overbeek teased an upcoming announcement: “We certainly have the capabilities to start deploying that in Japan if necessary. We are waiting to see whether that is something companies are serious about. It’s in progress.”

The Japan offensive is also homing in on commercial logistics and last-mile use cases as particularly promising. HERE can offer distribution partners a real-time routing algorithm that monitors and manages every major city in Japan in real time. It can optimise, at minute precision, the way trucks unload their cargo. The supplier is also exploring optimisation around the utilisation of cargo space within trucks.

“Today you have multiple companies driving their trucks in parallel. These generally use just 20% to 60% capacity. What if we combine that capacity data and location data, and then optimise it so we have fewer trucks running through the city?” asks Overbeek. “It will solve numerous traffic problems and reduce

pollution.” These are some of the application areas on which it is working with partner Mitsubishi Corporation. In December 2019, NTT and Mitsubishi Corporation announced plans to jointly invest in a 30% stake in HERE through newly established joint holding firm COCO Tech Holding B.V.

India

India is also set to play a key part in HERE’s global strategy. The company has located most of its production in Mumbai, where nearly 5,000 employees are building its products. But beyond its role as a production location, the country poses significant challenges for any location data provider: many roads have no names, many houses have no numbers. “You need different technologies to start mapping this, to make sure that you have a reliable database,” he says. “We are working with the latest technologies to enhance our India product in such a way that it will become the leading map there.”

As with Japan, transportation logistics companies are a top priority for the region. “We are in talks with the likes of TATA and Tech Mahindra and other companies that will be our strategic partners and embed our location database and services into their offer. They are talking to transportation and logistics companies, because that’s where many of the use cases resonate.”

The global opportunity

These are just a fraction of the regional markets and applications in which HERE sees growth potential


for location data moving forward. For the segment as a whole, Overbeek sees a multi-billion euro opportunity. “We think the total addressable B2B market is around €15bn (US\$17.6bn),” he says. “That’s pretty big.” This represents a combination of various automotive use cases, key among which are highly autonomous driving and logistics route planning and optimisation.

However, COVID-19 is making itself felt on some of these potential application areas. Overbeek believes the pandemic will slow down some of the general industry momentum around CASE (connected, autonomous, shared and electric) mobility, and points to the downturn in usership for many shared mobility schemes: “There will be an impact in the short and maybe even medium term, but that market will not go away. City officials realise that there needs to be a shift in transportation towards a different, more personalised means of travel.”

Long term, his outlook remains bullish. Overbeek anticipates a CAGR of roughly 15% to 20% over the coming years, depending on the specific service and opportunity around location data. “I see a shift in the addressable automotive market,” he states. “The traditional navigation use case will grow slightly as more cars become connected and offer on-board navigation solutions. Location-based services are also coming in, as well as other services that car manufacturers want to provide around logistics or the optimisation of their own supply chains. On the whole, it is clear to us that the strategic relevance of location data is ever-increasing.”



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Plug the charging gap: taking electric vehicles beyond the city

As the electric revolution gains pace, have towns and villages been missed off the map?

By Megan Lampinen

The number of electric vehicles (EVs) on the road has been growing steadily and most forecasts call for rapid acceleration in the years ahead. Europe, for example, saw registrations of electrically-chargeable vehicles jump by 53.3% in the second quarter this year. That boosted their market share from 2.4% in the same quarter last year to 7.2%. Transport & Environment expects that next year, one in every seven new cars sold in Europe will be either a plug-in hybrid or a full EV.

Pivotal to the segment's long-term success will be the supporting charging network: a solid combination of home, workplace and public charging. "Most EV drivers would already argue that charging infrastructure needs to improve, particularly if it is to accommodate this deluge of new EVs on the road," comments Pilgrim Beart, the founder and Chief Executive of

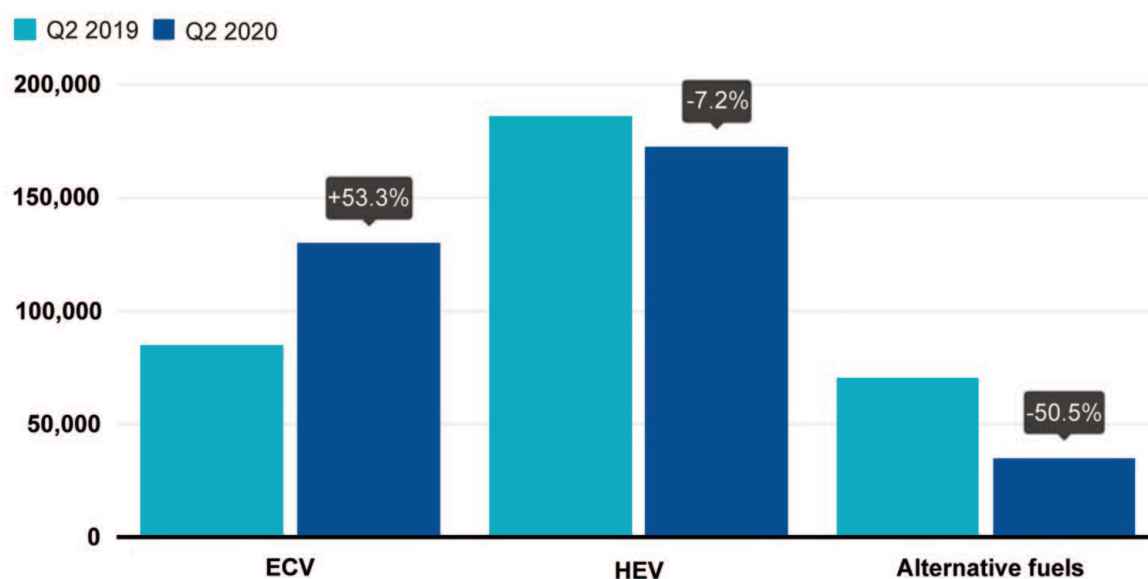
connectivity specialist DevicePilot. The company is helping public charging point providers to monitor their devices to improve overall service. But before players can even begin to delve into the charging experience they need to consider where to locate these stations.

Much of the focus around public charging has so far centred on urban applications and motorways, leaving towns and villages largely overlooked. Some players believe this gap could prove fatal to widespread EV uptake and are taking steps to address it before it becomes a real threat.

UK country pubs

ChargePoint was founded in California in 2007 and is the only EV charging company that designs, develops and builds its own charging hardware and software systems. The company

New passenger car registrations in the EU by alternative fuel type



Source: ACEA



Greene King plans to install chargers at 900 pub locations over the coming 18 months

believes that tapping locations outside of big cities will essentially democratise charging and make it more accessible to a wider demographic. “We don’t want EVs to be just for the wealthy,” says ChargePoint’s Chris Burghardt, Managing Director–Europe. “We cannot tell the car companies what kind of cars to produce and at what price points, but we are working to ensure that charging infrastructure is available to anyone, including people who cannot charge at home or at work and who want to drive electric.”

Towards this end it has teamed up with the UK’s largest pub retailer and brewer Greene King to deploy a charging network at its pubs. “Many of these pubs are located in villages across the country, close to the average citizen who is not an urban

dweller,” notes Burghardt. RAW Charging will fund, own and operate ChargePoint’s chargers across the Greene King-hosted network. The initial phase will see chargers installed at 900 pub locations over the coming 18 months. “We want people to be able to freely move around and have access to charging infrastructure without making an additional investment, as required with home chargers. The important thing here is that this offers that freedom,” Burghardt tells *Automotive World*.

It will also help build out a very visible charging network. Home charging stations are not usually seen by anyone other than the home owner, but a line of chargers outside the local pub, passed frequently by residents on their daily commute, will send a message. “If you see a charging



McDonald's wants to become a leading location for EV charging

station on a regular basis that's in a place where you typically park your car, you will more likely buy an EV," says Burghardt. "It makes you think, maybe it won't be so difficult to recharge my vehicle after all."

Fast food, fast charging

Elsewhere in the UK, a similar project is underway by InstaVolt and McDonald's, which aim to install rapid charging points across the fast food chain's drive-through locations. Notably, these are not city centre spots but those facilities that have enough space to accommodate a drive-through. When the news was

announced in June 2020 it marked the first partnership of its kind for a major restaurant chain in the UK. "Research shows that drivers need to be confident that fast, reliable and simple to use charging infrastructure is never far away, and this partnership will deliver that confidence to drivers nationwide," commented Adrian Keen, InstaVolt's Chief Executive Officer.

With more than 1,300 restaurants in the UK, McDonald's fits the bill. The Golden Arches also represent one of the most recognisable locations. For those that like fast food, it's an easy way to kill 20 minutes—enough time for an 80% charge. InstaVolt is the

largest owner-operated network of rapid EV chargers in the country and also one of ChargePoint's customers.

"This partnership and ambition takes advantage of our scale, and is a real step forward for those already driving EVs, as well as people considering making the switch," comments Paul Pomroy, Chief Executive of McDonald's UK & Ireland. The chain has bold ambitions on the charging front, with Pomroy stating that it eventually aims to have more EV charging points on its premises than any other company in the UK and Ireland.

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Drivers need to be confident that fast, reliable and simple to use charging infrastructure is never far away

Commenting on the similarity of the Greene King and McDonald's projects, Burghardt emphasises, "These are parking lots that are accessible and visible, in high traffic locations or in places where the communal life in more rural areas is organised." And they could be the new charging hot spots.

Post-COVID

Notably, both announcements emerged in the wake of the COVID-19 pandemic. The UK's recovery plan is guided by the premise of "building back better", and a focus on low carbon industries and infrastructure is a big part of that. "There is considerable focus on greening the economy as part of the recovery efforts, and that is extremely positive for our business in particular," says Burghardt. Other key markets, including France, Germany and Spain, [also put electrification at the centre of their post-COVID economic stimulus measures](#).

At the same time, the virus and its associated lockdowns have brought to light growing public awareness of the importance of EV charging. Traditional gasoline and diesel fuelling stations were classified as critical infrastructure from the start, and in the UK public fast-chargers also earned that recognition. "What's important—whether you drive a fuel vehicle or an EV—is that you have the infrastructure up and running in a crisis situation," Burghardt notes. "This shows just how mainstream it is becoming now. Really, there's a lot of positivity to come out of this negative situation."



Autonomous cars low on a hacker's hit list, for now

With bigger bounties available elsewhere, it is unclear exactly whether it is worth a hacker's time and money to crack an autonomous vehicle. By Freddie Holmes

To date, cyber attacks on modern vehicles have been led by 'white hat' hackers from the research community. The rationale is clear: find flaws and loopholes, and remedy them before those with malicious intent can exploit them. However, it remains unclear exactly what criminal operators stand to gain from cracking a connected, automated vehicle.

The basis for any cyber attack varies depending on the target in question: some may be financially motivated while others may be politically driven. Cyber warfare has also become increasingly common in military operations. Given that cyber attacks have been successfully carried out on

stationary devices for decades, hacking a potentially moving object seems like an unnecessary challenge.

However, experts recognise that hackers will take any opportunity to monetise vulnerable systems, and the risk of extortion, ransom or theft of personal property remains real with the autonomous vehicle (AV).

Is there money in it?

Chuck Brokish, Director of Automotive Business Development at Green Hills Software, says that while money is not the only driver behind a cyber attack, it is typically a key motivating factor.



Could the threat of being held ransom delay the timeline for autonomous vehicles?

“There are many reasons we see cyber attacks, some for money, some for terror, and some just because a hacker can do it. Most of the time, there needs to be a financial incentive to spend the resources to perform such attacks,” he explained. “There would certainly seem to be monetary reasons to target modern vehicles in cyber-attacks for ransomware.”

Speaking in June as part of a virtual panel discussion hosted by AV education group PAVE, Chris Urmson, Founder and Chief Executive of Aurora, noted that “most cyber crime is about making money” but that “there isn’t really that much money to be made in taking control of a vehicle on the road.”

“Professional hacking is not about fame and honour, it is a business and in business money always plays an important role. With this in mind, the automotive domain is an attractive target,” noted Rasmus Adler, Program Manager, Autonomous Systems at the Fraunhofer Institute for Experimental Software Engineering.

Whether a hacker can specifically target an AV for profit is unclear, but it is not a risk the automotive industry can take. Serious investment has been directed toward the adoption of advanced cyber security solutions, and many automakers have offered ‘Bug Bounties’ for researchers to find weaknesses. Independent penetration tests have already

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Professional hacking is not about fame and honour, it is a business and in business money always plays an important role

exposed flaws in everything from wireless key fobs and infotainment systems, to smartphone apps and on-board diagnostics (OBD) ports.

Perhaps the best-publicised case is the Jeep Hack in 2015, which resulted in the first legal dispute of its kind. [It was recently thrown out of a US court after pinballing around the legal system for years](#), but there has been no stronger example of the possibilities open to skilled hackers.

travel habits—including the date and time of each trip and the live location of the vehicle—have already been attained by researchers. In the future, a car’s ‘electronic wallet’ might also provide a means for hackers to siphon money from under the driver’s nose.

Steve Wernikoff is a litigation partner at Detroit-headquartered law firm Honigman LLP, and previously served as a senior enforcement attorney at the Federal Trade Commission (FTC).

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If someone can hold an entire fleet of vehicles ransom, that could certainly have a devastating effect

Held to ransom

At a basic level, there is certainly money to be gained by exploiting electronic systems to steal a modern vehicle—[some believe cars could even be programmed to ‘steal themselves’ and drive to the criminal’s location](#).

Given that most connected and partially automated models reside in the premium sector, these cars could be worth upwards of US\$40,000 each.

Cyber attacks can also access private data that is stored in the vehicle with relative ease. Granular insights into

He now co-leads the firm’s Data Security and Privacy Litigation and Autonomous Vehicle practices.

“Hackers can obtain valuable data from the vehicles,” he explained, “which may store a fair amount of sensitive personal information about individuals, including data contained on phones that have been paired with the vehicle.”

Rebecca Chaney, a partner in Crowell & Moring’s Mass Tort, Transportation, Digital Transformation practices, shares a similar view. “Cars increasingly contain a treasure trove



Driver assistance systems can already allow hackers to remotely control steering, acceleration and braking

A hacker may be able to prevent access to a vehicle unless a ransom is paid, suggested Wernikoff: “And if a hacker could gain access to a fleet of vehicles, they could in theory require a ransom from the owner to gain access to that fleet, which could be a very disruptive and profitable hack.”

Green Hills Software’s Brokish agrees that the concept of holding an AV hostage is not as far-fetched as some may think. “We continue to see more stories in the cyber security news about ransomware attacks on corporations. Much of the ransomware today is on corporate servers, but if someone can hold an entire fleet of vehicles ransom, that could certainly have a devastating effect not only on the automotive company, but also the customers using those vehicles,” he said. “In that case, the companies would likely be forced to pay the ransom just to keep their customers operational.”

Crowell and Moring’s Chaney added that by deploying ransomware, a hacker could demand money not only to cease the attack, but also to explain how it was achieved. “With that said, automakers and other industry players are aware of these threats and are already using best-in-class technology to prevent them,” she affirmed.

of personal information that could be valuable to hackers, from location and biometric data to passwords for connected devices,” she observed. “And unlike laptops and cell phones, for which users are more familiar with how to protect themselves, vehicle owners may not be as proactive in protecting data in their vehicles.”

If a hacker is able to access safety-critical driver controls—the acceleration, braking and steering systems—the risks become even greater. “The chances that an operator can avoid an accident generally decreases with an increasing level of automation,” said Christian Jung, Department Head, Security Engineering at Fraunhofer IESE. “Hence, we assume that the consequences of hacked autonomous cars would be more significant than for traditional vehicles.”

Today, authorities tend to recommend that ransomware bounties are not paid—no less due to the fact that there is no guarantee that the criminal behind the screen will cede control of personal data once a payment is made. However, the implications of not settling a ransom for a runaway AV could mean that payments are unavoidable. “Hacking a self-driving car could also advance a hacker’s reputation and lead to paid opportunities for similar work,” noted Chaney.

A growing motivation to hack

Hacking an organisation’s computer systems is tried and tested, and the culprits are not often brought to

justice. It may also be too time-consuming and expensive to execute a cyber attack on modern vehicles at this stage. However, the growth in new electronic systems in connected, automated and electric vehicles is opening up new opportunities for hackers to ply their trade.

“There is no longer much of a difference between hacking a computer and hacking a connected vehicle,” Wernikoff explained. “A connected vehicle is a computer, or rather a set of computers.” The basics of a hacking a desktop computer and a vehicle may be similar, but the level of risk is very different: one is stationary, while the other can weigh around two tonnes and travel at speeds in excess of 70mph.

The potential for immediate physical damage is what has the industry most concerned about an AV hack, and the ramifications are far wider than simply inconvenience or lost profits. Public authorities could be held to the sword by a hacker that has control over a fleet of vehicles, blocking roads, causing damage and putting emergency services under severe pressure. Human lives would also be put at risk.

“In theory, if a hacker gained access to a fleet of vehicles it could cause a serious incident if they were able to incapacitate the vehicles while moving,” concluded Wernikoff. “Most of these hacks are theoretical at this point and have only been proven possible in extremely controlled research scenarios. But in light of the potential profit and harm that can be done by such hacks, the motivation to attempt them likely will continue.”

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In light of the potential profit and harm that can be done by such hacks, the motivation to attempt them likely will continue



Car-sharing cuts emissions, but not all services are equal

A complex array of factors make the true impact of car-sharing unclear, but the right approach can slash emissions. By Freddie Holmes



In a bid to reduce urban traffic congestion and rising air pollution, numerous companies have proposed car-sharing as a solution. However, the irony is that cars have immediately become more accessible, and questions are being asked of car-sharing's supposedly green credentials.

Fleets of shared cars have popped up across cities, either with dedicated collection and pick-up spots, or 'free-floating' with flexibility over where the vehicle can be left. These cars can be accessed by anyone with a driver's license, at any time of the day, and with just a smartphone. Prospective customers include those who may not wish to drive their car into the city, or who may not own a car at all.

Car-share companies argue that fewer private vehicles will be required, with one car serving the needs of various travellers. However, shared cars typically see far greater

utilisation, and can encourage consumers to drive when they might otherwise have taken the bus, train or bicycle. In essence, car-sharing can provide a means of affordable motoring with no long-term commitment. "Car sharing retains the experience of self-reliant mobility and reduces the underestimated costs of car ownership," observes Justas Petronis, Senior Content Strategist at Trafi.

And so the question must be asked: is car-sharing part of the problem it aims to solve, and is it as green as companies profess?

To share or not to share

Part of the problem is that shared vehicles are not always shared, and single occupancy trips remain common.

Car-sharing does not necessarily encourage shared mobility



A 2020 report from the International Transport Forum, found that a private car in Europe clocks up around 7,500 miles a year, with an average of 1.5 passengers during each trip. By comparison, a shared ‘ride-sourcing car’ racks up four times as many vehicle miles travelled (VMT) each year (30,000 miles), while carrying fewer passengers (0.95) on average.

“With car-sharing specifically, it seems intuitive that having fewer vehicles that are used more often by many people is great. However, if the actual rides taken with those vehicles are not shared, the average positive effect of

car-sharing remains less impactful than it can be,” explains Petronis. “If we focus on the per person carbon footprint, shared rides significantly reduce the negative environmental and public health impact.”

According to a 2018 study published in the *Journal of Cleaner Production*, car-sharing companies have tried to “profit from the fact” that consumers have become more aware of the environmental impact of a car, and thus steer their marketing towards the perceived environmental benefits of sharing. Business to consumer (B2C) car-sharing services, it says, are based on the idea of ‘access-based

Car-sharing can encourage drivers to leave their car at home, and in some cases sell it

consumption' as opposed to the sharing economy. Peer-to-peer (P2P) car-sharing offered by the likes of Turo, BlaBlaCar or Getaround can be more fairly associated with the sharing economy, the report found.

A similar issue can be seen with ride-hailing services such as Uber, Lyft or Grab, which promise to take cars off the road while their own fleets continued to expand. "Ride-hailing organisations often speak about how underutilised cars are, how efficient their business models are at utilising them. But these vehicles put millions of empty miles on the road for the convenience of their users," commented Rachel Zack, Director of Policy at San Francisco-based Remix, which helps local governments to reshape their transportation networks.

Can car-sharing be clean?

Car-sharing can lead to an overall reduction in VMT and greenhouse gas (GHG) emissions. However, the benefits vary depending on the service in question and how it is used.

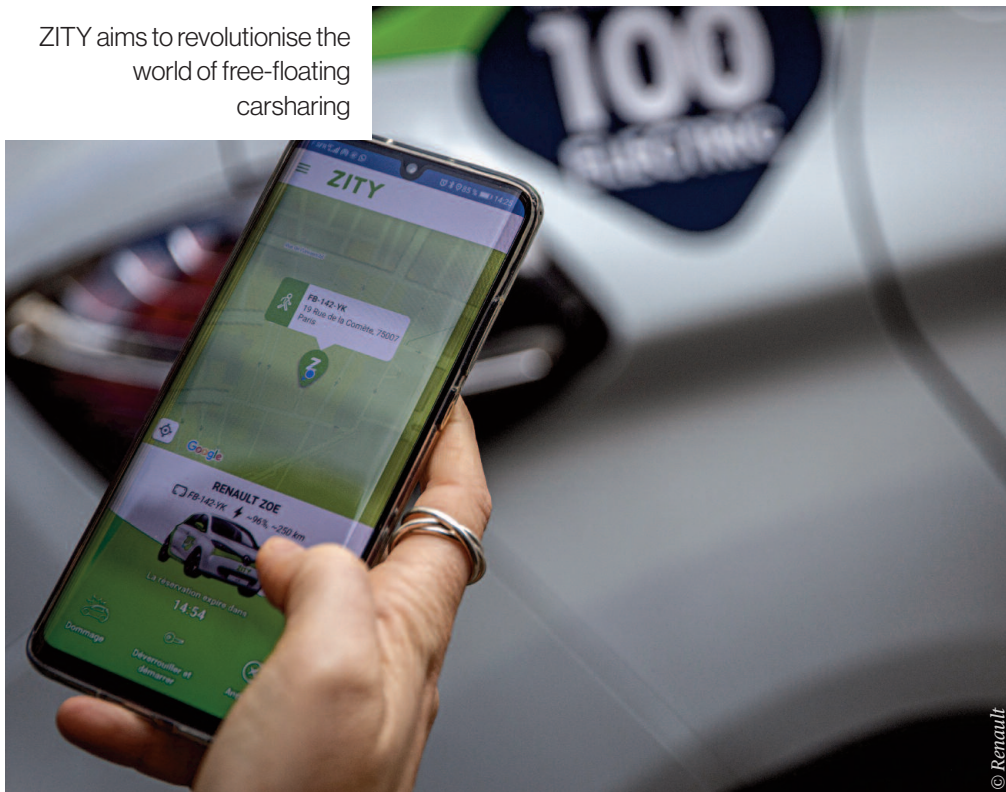
Research from Susan Shaheen, a professor at the University of California, Berkley's Transportation Sustainability Research Centre, found that one car-sharing vehicle can replace as many as 13 private vehicles



when used as part of a round-trip service. This is where a user will book a car from a set location, and return the vehicle to the same spot. The average North American household could reduce its GHG emissions by as much as 41% each year, Shaheen found. By comparison, a pay-by-the-minute 'one-way' service such as car2go might replace up to 11 vehicles, and potentially offer a significantly lower reduction in GHG emissions of between 4% and 18%.

Studies have shown that users of one-way car-sharing services are less likely to consider selling their car and tend to use public transport less frequently. They also tend to take more car-sharing trips per day. The opposite can be said of round-trip car-share services, which typically lead to a decrease in the number of vehicles per household. A 2014 study in Vancouver found that the number of vehicles per household fell from 0.7 to 0.51 on average after users joined round-trip service Modo. By comparison, users of free-floating

ZITY aims to revolutionise the world of free-floating carsharing



service car2go saw the number of vehicles per household average fall from 1.06 to 1.01.

Remix's Zack explained that one of the main benefits of car-sharing is that consumer travel habits can be reshaped. "Emissions savings from car-sharing comes from allowing people to get rid of a vehicle, or not purchase one, thus translating to fewer vehicle trips overall," she told *Automotive World*. Zack also pointed to the irony that greater vehicle utilisation is often conflated with lower vehicle emissions: "Using cars less is a good thing if your goal is to reduce emissions."

Let's pool

From that perspective, car-pooling might present the best opportunity for green car-sharing. This model does not require new vehicles to be manufactured, and ensures that more passengers are carried by a single

vehicle à la public transit. By the Airbnb analogy, this might be more akin to renting out a room in a shared house.

In the UK, roughly 2.5 million people share their drive to work each year, according to car-pooling firm Liftshare. This, it says, removes about 1.25 million cars from the road and prevents around 1.25 million tonnes of annual CO2 emissions. A study commissioned by BlaBlaCar, which surveyed nearly 7,000 users across eight countries, found that 1.6 million tonnes of CO2 were prevented through pooled rides organised via the BlaBlaCar app in 2018. The average occupancy rate was 3.9 people per car, and 28% of passengers intended to delay learning to drive.

"Car-pooling is something I have spent a huge chunk of my career trying to make happen due to its amazing potential to reduce VMT," said Remix's Zack. "One agency I worked for decided to solely focus on

Free-floating car-sharing is seen as a less effective means of tackling air pollution and traffic congestion

car-pooling—as opposed to cycling or walking—as its VMT reduction strategy because its potential to make an impact was just that much higher.”

Does the Airbnb model have a place in the auto industry?

The Airbnb model is still finding its feet in the automotive industry, but a plethora of services are now able to lure drivers away from private vehicle ownership. Work must be done to ensure public transit ridership does not slide, and single-occupancy trips remain a concern at this stage.

Car-sharing appears to have a positive impact on GHG emissions and VMT. Consumer-led car-sharing initiatives may have the most significant benefits on this front given that rides will typically be shared between locals, perhaps even neighbours, and so the need for both parties to own a car falls. The impact of B2C car-sharing is harder to generalise; one-way trips appear to be the least efficient means of car-sharing and do little to discourage single-occupancy driving. By contrast, the round trip model has been shown to directly reduce emissions and encourage drivers to give up their own car.



It must also be recognised that a growing number of B2C services now rely on fully electric vehicles (EVs). Volkswagen’s WeShare brand has a fleet of 1,500 free-floating Volkswagen e-Golfs in Berlin, for example. In Madrid, the Zity service relies on Renault Zoe EVs. Localised tailpipe emissions may fall as a result, but trends have shown that free-floating services generally do little to discourage the use of private vehicles, the majority of which rely on diesel or gasoline. EVs accounted for just 7.2% of all new car registrations in the European Union in the second quarter of 2020.

Successful Airbnb ventures book as many guests as possible to maximise the profitability of the asset. The same thinking must apply with car-sharing from a sustainability perspective, or the Airbnb model risks an unwelcome stay in the automotive industry.

Tech alone not enough to realise a Vision Zero future for trucking

Clear regulatory guidance, continued development and a safety-first culture will be critical in realising Vision Zero, say industry groups. By Jack Hunsley

Driving is an inherently dangerous task, ranking as the eight most likely cause of death according to the World Health Organisation. And while the automotive industry has worked hard to reduce road fatalities it is still far from reaching its goal of Vision Zero.

This is not to say that the sector hasn't made progress. In the European Union (EU), for example, annual road fatalities have dropped by 42.4% since 2006. The EU's roads are also among the safest in the world, counting just 48 fatalities per million inhabitants annually compared to the global average of 182. It's a promising start, but work remains on reaching zero. "All major players in the mobility sector agree that road casualties should be further reduced, with the vision of working towards zero traffic fatalities in the future," the European Automobile Manufacturers' Association (ACEA) told *Automotive World*. "The only way to reach this goal is by ensuring that safe vehicles are driven by safe drivers on safe roads."

By contrast, in the US, truck-related deaths have been on the rise since 2011, according to the US Department of Transportation's Fatality Analysis Reporting System. 678 truckers lost their lives in 2018, but it was those outside the truck that were most at risk; in a two-vehicle crash involving a passenger vehicle and a large truck, passenger vehicle occupants accounted for 96% of fatalities.



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“We believe that we can make and should make communities, consumers and roads safer for everyone. That includes those in the commercial vehicle space as well as their customers and the people that they come in contact with daily,” said Ann Wilson, Senior Vice President of Government Affairs of the Motor and Equipment Manufacturers Association (MEMA). Representing light vehicle and commercial vehicle players, MEMA serves as the voice of the motor vehicle and mobility supplier industry in the US. “Just like everyone else in the industry, MEMA is focused on safety and the benefits of safety technology, both in the heavy and light vehicle arenas,” she added.

Tech innovation

Technology is at the core of the Vision Zero motto. Humans are fallible by nature, and if the truck sector is to reach Vision Zero, automated safety technologies will be the cornerstone.

“Self-driving and automated vehicles will have the ability to navigate independently, only requiring driver input when the system asks the driver to take over,” said ACEA. “Using on-board sensors and evaluation equipment, they will have a 360-degree view of their surroundings at all times.” At lower autonomy levels these sensors can help operators iron out driver errors. As technology advances, these sensors could remove the need for a human driver at all.



Autonomous trucks could radically change the transport sector

“Removing the driver from the equation will also reduce the element of human error in driving,” ACEA added. “As these vehicles come equipped with sophisticated on-board sensors, cameras, GPS, radar and safety systems, they will also be able to drastically reduce the impact of any accidents.”

It will take time to cycle out non-automated vehicles, however. “Over the next 15 or 20 years we’ll see truck fleets move to automated vehicles and to more fully automated trucks,” said Catherine Boland, Vice President, Legislative Affairs, MEMA. As she added, driver shortages could aid this uptake: “Truck fleets are having a hard time finding drivers with the skill and the willingness to do the job. Automated vehicles will help fleets continue to meet the demands of their customers and ship goods across the country.”

While fully automated vehicles wait, adoption of automatic emergency braking (AEB) and other advanced driver assistance systems (ADAS) could improve conditions today. These technologies could also kickstart the industry’s broader autonomy adoption. “We see automated technology as stepping stones,” said Wilson. “As truck fleets start to adopt individual automated technologies the acceptance rate of automated vehicles is going to increase, as is the understanding of what these technologies are capable of.”

“ADAS will play a crucial role in the medium term to prepare drivers and other road users for the reality of vehicles taking over control from drivers as we gradually move towards fully automated vehicles,” added ACEA. “ADAS can already take over



Clear regulation and enforceable standards have always been critical to improving road safety. But operators need smarter, more internationally harmonised standards

safety-critical functions from the driver under certain circumstances. Active safety measures such as AEB and lane-keeping assistance are great examples of partially automated ADAS technology helping to avoid human error and prevent accidents that are in-use today.”

There is also a surge in interest in leveraging connectivity. Telematics can give fleets great insight into their operations, but this data also has huge safety potential.

“Exchanging safety-critical information between nearby vehicles and infrastructure makes it possible to drive down the number of accidents and casualties,” said ACEA.

“Cooperative Intelligent Transport Systems (C-ITS) are increasingly facilitating networking between connected vehicles and their



© Daimler

surroundings.” C-ITS can be used to detect traffic flow, with this information already being used in certain markets to implement variable speed limits and to flexibly open and close lanes depending on circumstances.

Regulation

However, technology advancement alone will not be enough. It is also critical to build a suitable regulatory environment for this technology. As Wilson detailed, MEMA is eager to educate both US regulators and legislators on autonomy’s potential.

“We are not in as aggressive a regulatory environment as other parts of the world right now, but we have been working with the Trump administration and before that on a programme called Beyond Compliance,” she said. Though not yet officially launched, Beyond Compliance aims to urge

Today’s ADAS technology could significantly reduce truck-related fatalities, but developers and fleets need clear regulatory guidance

manufacturers to adopt cutting edge safety technologies not yet mandated by regulation. “That was an effort that we helped shepherd through and we feel very strongly that it could assist the industry,” Wilson added.

Legislation and Euro-NCAP assessments are providing a framework for ongoing investments in Europe’s Vision Zero mission. Further improvements, however, will rely on all stakeholders cooperating. “It is important to see safety as a system to which all parties need to contribute. Further improving road safety does not only depend on equipping vehicles with more safety features,” said ACEA. “Human error, such as distraction, poor anticipation and violation of traffic rules, is the cause of 90% of today’s accidents. This means that we need to combine cutting-edge vehicle technology with improved driver behaviour, better road design and maintenance, and better enforcement of existing traffic regulations.”

“Clear regulation and enforceable standards have always been critical to improving road safety. But operators need smarter, more internationally harmonised standards, especially in neighbouring countries, that lower innovation investment costs, and enable easier and more streamlined reporting and measurement,” Jens Hügel, Senior Adviser, Goods Transport, International Road Transport Union (IRU) added. “Ultimately, we need governments to help create a better framework within

which operators themselves can better invest in vehicles and skills development. Furthermore, internationally harmonised standards are needed to make the best use of operational and technical innovation, to improve road safety, for the benefit of everyone.”

The US’s Vision Zero regulatory journey is also far from complete. Though it boasts a fairly flexible AV testing approach, the US Congress has struggled for years to pass legislation on automated vehicles. This legislation also often failed to address the needs of heavy goods vehicles. Progress is reliant on educating these officials.

“One of the issues that we try to educate both regulators and legislators on is the tendency when talking about automated technologies to jump to

fully automated vehicles,” said Wilson. “There is a reluctance among some policymakers to embrace the possibility and benefits of ADAS solutions and we continue to try to work with them to make sure that they understand that the benefits are there.” Real-world pilots will act as critical evidence in this mission. “Testing and real-world usage are necessary to prove this out,” Wilson added. “We strongly believe as an industry that the commercial vehicle space has a very important role to play in testing these vehicles out on US roads.”

Is it achievable?

Plenty of work remains, but those working in the truck space are confident in Vision Zero, even if the sector may struggle to ever hit zero at all in reality. “Vision Zero is achievable and a goal that all truck manufacturers are committed to achieving as soon as possible,” said ACEA. “It will require a stepwise approach, rapid market adoption of new technologies and last but not least an equally rapid roll-out of infrastructure.”

To kickstart the journey, however, safety cultures must shift. Though operators understandably must weigh up the return on investment for all new technologies, a product’s lifetime safety potential cannot be discounted. “If you looked at the US 30 to 40 years ago, seatbelt usage was not very common. Now I know very few people who would get in a vehicle and not buckle up first thing,” said Boland. “If you look at the results from fleets who have installed vehicle safety technology they see the return on investment (ROI) fairly quickly and then they, in turn, install it on more of their vehicles. Making trucks safer and mitigating crashes is a huge ROI for them.”

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We need to combine cutting-edge vehicle technology with improved driver behaviour, better road design and maintenance, and better enforcement of existing traffic regulations



INTERVIEW:

Maxime Flament, Chief Technical Officer, 5GAA

A new road map for vehicle connectivity has been released, but how does it relate to the smart city? By Freddie Holmes

Enabling vehicles to communicate with nearby traffic, pedestrians and cyclists is seen as a vital next step in preventing road collisions. Organisations have been put together to accelerate the deployment of new vehicle connectivity solutions, and in recent years have worked with cities to see how they fare.

The 5G Automotive Association (5GAA) was founded in 2016 in a bid to do just that. With its 130-strong membership base including automakers, Tier 1 suppliers and numerous others from the IT sector, it has been pushing hard for cellular vehicle-to-everything (C-V2X) technology, working closely with public

authorities and industry stakeholders to get public trials in place. In October it revealed its new long-term strategy—the 2030 Roadmap for Automotive Connectivity—which details real-world applications that will hit the market over the next decade.

Maxime Flament joined the 5GAA as Chief Technical Officer in 2018, bringing valuable experience from his time with Ertico, a European association promoting research around Intelligent Transportation Systems. Speaking to *Automotive World*, Flament shared his perspective on how coming advances in vehicle connectivity are shaping the creation of smart cities.

What is your definition of a smart city, and how important is the megatrend of connectivity in meeting that vision?

One does not go without the other: if you want to have a smart city, the smart city has to live from a flow of data. And based on this data, intelligence must be derived to become smart. If data cannot be collected and leveraged in the right way, that will pose a real problem to achieving the goals of a smart city.

‘Smart’ means optimising the city to limit issues that negatively impact time, cost and the environment. In combination with the trends of electrification, shared mobility and automation, connectivity will be essential. Using data, we can find means of optimisation that eventually impact society for the good.

Are there any cities that have made particularly strong progress in becoming ‘smart’?

Everyone is champion in some aspect of a smart city, but you cannot point to one single city that does it all. That being said, one city that always jumps into my mind in terms of mobility is Copenhagen, which for years has had forward-looking policies and objectives toward improving mobility, the environment and living standards.

The city’s policies have been followed by several positive measures, which have been strongly adopted by residents in terms of the use of bicycles and public transport, and generally

discouraging the use of personal vehicles within the city centre.

The 5GAA has said it expects connectivity to become ever more important in future. Why is that?

Our view on the growing importance of connectivity relates primarily to the vehicles themselves. All automakers around the world are directing their strategies toward connectivity, and there will eventually be some 400 million vehicles that are connected in Europe. When we look at the reasons for connecting a vehicle—or anything for that matter—the most obvious is to perform over-the-air (OTA) updates. I see this as the Holy Grail, because the user experience can be improved over the lifetime of the product.

In cities, the trend of digitising transportation is also happening whether we like it or not. We need to optimise our environment, and this means we need to collect data through connectivity, document any issues digitally, and eventually find measures that can avoid unnecessary losses related to safety, time, money and the environment. All of this justifies why connectivity is so important in the future.

What kind of discussions does the 5GAA engage in with city authorities?

As a global industry organisation, we first turn to our members to see what we want to achieve. However, there are shared common goals between the industry and the public sector that relate to safety, efficiency and sustainability, which also help to shape our strategies.

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‘Smart’ means optimising the city to limit issues that negatively impact time, cost and the environment

Maxime Flament
5GAA



When we work with governments, we can outline the various advantages of all these new technologies and solutions becoming available. In general, these ideas are welcomed warmly. The challenge is that our strategies need to fall into a global mobility policy framework, which can differ significantly between different countries. We are trying to find a solution that is flexible enough to answer policies in different parts of the world. For example, Copenhagen has different policies on the use of personal vehicles compared to somewhere such as Singapore or the US.

In Europe, there has been some divergence in the adoption of certain technologies. For example, about a year ago we were fighting against a technology non-neutral regulation that favoured Wi-Fi specifically. From our point of view, that was not the right way to go in terms of policy. We asked the regulators to create a level playing field for the market that is based on common principles and goals. This recommendation was received positively.

Dedicated short-range communications (DSRC) technology was once seen as the future of

vehicle-to-vehicle connectivity, but interest appears to have faded. From your perspective, does DSRC have a role to play in a smart city, or will 5G render it obsolete?

It is important to understand that C-V2X combines both short- and long-range technology to offer the best of both worlds. Long-range uses readily available 4G networks and will eventually use 5G, which connects to Cloud services. There are numerous update and warning services that have already been proven to work well. However, 4G cannot guarantee the quality of service and there are known shortcomings with latency, which is why 5G is so important down the line.

The standard that is behind C-V2X gained a new feature in 2017 called sidelink, which provides the ability to perform device-to-device communication. That is the main problem for DSRC, which previously played that role in short-range communications. Following the update, we now have a far greater standard that includes both short- and long-range communications, and is a more comprehensive solution.

Importantly, short-range communications is not dependent on network coverage, so 4G and 5G device-to-device solutions will always work regardless of whether you are in a tunnel, out in the countryside or wherever there is no mobile network. It should also be said that the benefits of such technology depends on the rate in which such equipment is adopted: the first vehicle with short-range communications will not be useful because it will be unable to share messages with any other vehicles. When market penetration of this technology reaches around 20%, the benefits really begin to become clear.

5G is clearly the technology of choice for the automakers moving forward, and given that it also brings the ability for short-range communication, DSRC is now obsolete in some respects.

With a rise in cyclists, e-scooters, joggers and walkers in urban areas, what can vehicle connectivity do to help keep vulnerable road users (VRUs) safe?

VRUs clearly have to be part of the safety equation. From our point of view, there are two approaches: network-based and direct communications. Currently, no approaches are optimal. For direct communication solutions, we are highly dependent on the availability of affordable, low-power devices. For example, we may see short-range communications capabilities directly integrated within your smartphone, backpack or bicycle in future. Vehicles could then communicate with these directly for alerts and warnings.

One challenge is the unpredictable nature of a pedestrian or cyclist, and sensors are required to understand where they are heading. Network-based

solutions are dependent on the consumer allowing an app to share dynamic information with the Cloud, but the benefit is that surrounding vehicles could be alerted to their presence. Edge computing will also be useful, because information can be shared quickly and securely between road users in a local environment.

One solution that is close to the market is a detection system within the vehicle that can broadcast the presence of nearby cyclists or pedestrians to other connected vehicles. It is extremely useful in congested areas, where cyclists may be overtaking or suddenly making a turn off the road. New cars on the market today already feature similar systems that can ensure the driver does not open the door into an approaching cyclist.

The 5GAA's 2030 roadmap is said to be the 'tip of the iceberg' with regards to upcoming advances in connectivity. Please could you elaborate?

We have to acknowledge that many members are actively preparing new products in a highly competitive environment, and automakers understandably do not want to announce too much too soon. And because the 5GAA is an industrial organisation, we have to respect anti-trust competition laws that forbid us to share information relating to product planning.

Our 2030 Road Map was prepared within the limits of this anti-trust regulation, and is the most we could reveal according to the current consensus among our members. We hope that it provides a clear indication that we as an industry are serious about deploying these new innovations in vehicles and cities.



Navistar and Traton reach US\$3.7bn agreement in principle

The latest offer should see Traton become the sole owner of Navistar, but pen is yet to be put to paper.

By Freddie Holmes

The Traton-Navistar saga appears to be nearing its conclusion, with plans to acquire the US truck maker all but confirmed. Following months of back and forth, a series of revised offers and a deadline that went down to the wire, the pair appear to have reached an agreement over a US\$3.7bn takeover.

Traton was formed in 2018 after the Volkswagen Group separated its truck and passenger car operations. The new company combines Scania, MAN Truck & Bus and Volkswagen Caminhões e Ônibus—as well as a 16.8% stake in Navistar, a minor stake in Sinotruk and [a partnership with Hino](#). A buyout of Navistar would dramatically improve Traton’s presence in North America, and reduce its reliance on Europe and Brazil.

Both parties have made it clear that the agreement remains informal at this stage, with a definitive contract yet to be approved by their respective boards. However, it is the first sign of real progress in a story that has rolled on for the best part of a year.

In January 2020, Traton formally submitted a US\$2.9bn offer to acquire all outstanding shares in Navistar at a price of US\$35 per share. The pandemic essentially put discussions on ice, and it was unclear whether the deal would be derailed. Industry observers remained bullish that an acquisition would go through.

Jonathan Storey, author of [a recent *Automotive World* report on Navistar’s strategic outlook](#), noted in March that a buyout of Navistar seemed “a long-term inevitability,” with Traton

Navistar will provide a welcome expansion for Traton in North America



© Navistar

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We intend to work with Navistar towards prompt finalisation of the transaction

*Matthias Gruendler
Traton*



© Traton

looking the most likely suitor since a strategic alliance was formed between the two back in 2016.

Equity research firm Jefferies maintained a similar perspective on 20 July. “We continue to believe Traton’s purchase of Navistar is a question of when rather than if,” it said.

Deadline day

On 10 September, Traton tendered a new, higher offer. Four days later, Navistar advised that it was carefully considering the proposal of US\$43 per share, which would now value the Illinois-headquartered truck maker at US\$3.6bn—up from US\$2.9bn previously.

However, the deal hinged on winning over two of Navistar’s biggest shareholders, who together own about 40% of Navistar shares. On October 14, Traton posed an ultimatum: accept the offer of US\$43 per share from September, or it’s off

the table. A formal deadline was announced: 6pm CET on 16 October.

The deal went down to the wire, and in a letter to Traton Chief Executive Matthias Gründler on deadline day, Navistar Executive Chairman, Troy Clarke, countered with a proposal of US\$44.50 per share. Navistar’s primary shareholders were seemingly now on side, and the ball was back in Traton’s court.

“Consistent with our conversations and your separate conversations with our two largest shareholders,” Clarke wrote, “the Navistar Board would be prepared to move forward with a transaction [...] for US\$44.50 per share.”

In response, Gründler immediately confirmed that the proposal would be “an acceptable basis for finalisation of definitive agreements.” Chief Financial Officer Christian Schultz, who sits on the Navistar board, also signed the letter, which essentially serves as a gentleman’s agreement.

A position of strength

Traton's Gründler has advised that the next step will be a formal agreement that will bring the acquisition to a successful close. "We intend to work with Navistar towards prompt finalisation of the transaction," he said on 16 October. "For the sake of clarity, we note that the proposal in this letter is an expression of intent only, and shall not create any legally binding obligations."

strengthens Traton's balance sheet for the Navistar acquisition," it added.

Bringing Navistar into the fold will create a truly global powerhouse in the truck industry, [a target that Traton outlined previously in January 2019](#). "We want to be the most profitable commercial vehicle player," said Andreas Renschler, then Chief Executive of Traton, during the Traton Group Capital Markets Day. "We want

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We want to be the most profitable commercial vehicle player. We want access to all major global profit pools, and to do this in a smart way

It has been a busy period for Traton, which also took a minor stake in self-driving truck developer TuSimple in September. The strategic partnership aims to deploy autonomous Scania trucks in Sweden on a 300km route between Södertälje and Jönköping.

The company also seems to be in good shape amid the COVID-19 pandemic. Traton's pre-released Q3 2020 results "significantly beat expectations" according to analysis from Jefferies posted on 22 October. "Better cash performance

access to all major global profit pools, and to do this in a smart way."

The acquisition will also bring additional clout on the e-mobility front; [Navistar has been slowly ramping up its development of battery electric buses in particular](#). Refuse trucks and delivery vehicles are also on the agenda. Broadly speaking, the combined development teams at Traton and Navistar will make for a fearsome opponent in the global truck and bus industry, and it will be interesting to see whether antitrust rules slow the acquisition process at all.

Talent development pivotal to realising the future of mobility

**SEAT targets employee training as the
cornerstone of its electric transformation,
writes Megan Lampinen**





The CASE (connected, autonomous, shared and electric) megatrends reshaping the mobility industry pose numerous challenges for incumbent players. Employees with decades of experience in traditional internal combustion engines (ICE) may suddenly find themselves out of their depth when it comes to the smart, clean vehicles arriving on the market today. Addressing that skills gap and preparing the established workforce for the vehicles of tomorrow will be essential if the industry is to realise the full potential of CASE technology.

SEAT's electromobility Learning Center

SEAT is jockeying for a leadership position in the electric vehicle (EV) segment and, like many other

brands, is in the midst of a wide-ranging e-mobility offensive. Although the company only has one EV on the market at the moment, the Mii Electric, it plans to introduce five new electric and plug-in hybrid models across the SEAT and CUPRA brands over the course of 2020 and 2021.

But simply putting EVs on the market is not enough to guarantee a successful electric future. SEAT wants to make sure its employees have a solid understanding of this technology, including how it works, how to manufacture it and how to avoid potentially unsafe actions with regards to it. For instance, factory workers making these EVs and plug-ins will need specialised training in working with high active voltage, such as how to connect and disconnect electrical systems.



SEAT Mii Electric

SEAT is ensuring its employees will be prepared to manufacture hybrid electric and pure electric vehicles



“In order to ensure that our new products set a benchmark, there is an ambitious plan to improve employees’ skills,” says Xavier Ros, SEAT Executive Vice President for Human Resources and Organisation. That’s where the electromobility Learning Center (eLC) comes in. Located within SEAT’s Martorell production facility in Spain, the eLC is dedicated to offering employee training on EVs. Plans for the centre have been underway for about two years and it officially opened its doors in late August 2020. As Ros explains, it’s all about preparing in-house talent for a new normal: “In order to carry out the new paradigm shift towards electric and hybrid vehicles, talent development and prior preparation are key.”

The courses at the eLC run for two to 16 hours and are offered to SEAT’s more than 15,000 employees, though

training is mandatory for specific jobs. In addition, the company has organised an EV awareness course which is compulsory for all employees, including those in support areas not directly linked to production such as finance, human resources, sales, marketing, etc. As with all training provided by the company, SEAT employees receive a certificate upon completion of the course.

Production, repair, maintenance

SEAT has been preparing for the e-mobility shift for more than a decade. Back in 2010, it built a small run of electric Altea models with the aim of defining, developing and practicing the methodologies and techniques that the technology requires. “During this project—a decade ago now—the



The 400 square metre building is located in the heart of the SEAT plant in Martorell

component installation during assembly. With an EV, it's the battery pack. "It is necessary to modify the layout of the production plant and the assembly order to include the exact moment when the battery pack is mounted in the vehicle," he says. "In this way, work begins with live power, once the pack is connected to the vehicle's electrical system."

EVs also entail the incorporation of new systems relating to the electrical supply of the motors, the control of these motors, and the charging of the battery pack. The capacity of the cooling system is also increased. And all these new systems must be incorporated into the revised manufacturing process in an efficient way.

While factory floor workers are a key focus for training, SEAT is also targeting operations outside the factory. "For each new model, whether electric, hybrid or combustion, the company always develops specific training plans for the 'aftersales, repair and maintenance' team," explains Ros. "The paradigm shift brought about by the new way of manufacturing EVs requires other professionals who are involved in day-to-day operations, such as the maintenance teams, to also adapt to the new technologies and face the new manufacturing challenges."

future training needs of employees were identified, analysed and defined," explains Ros.

On the plant floor, EVs entail several substantial modifications to the traditional manufacturing process. With ICE vehicles, the engine and the gearbox represent the biggest

EVs entail substantial modifications to the production process



SEAT regards it as essential that the aftermarket teams are well trained in order to provide exceptional customer service, particularly as many consumers require education around e-mobility. “Society’s general knowledge is essential to achieve any kind of transformation,” he adds. “Above all, when such a major change in habits is involved, it is necessary to inform and train all of society about the characteristics and benefits of hybrid and electric vehicles.”

Beyond electrification

Nurturing employees and ensuring they develop the new skills and understanding required for future mobility goes far beyond

electrification. For instance, in 2017 SEAT launched an employee training programme on Industry 4.0, covering such innovative technologies as virtual and augmented reality, collaborate robots and 3D printing. Over the past three years, around 3,000 people have successfully completed the Industry 4.0 training programme.

In total, SEAT allocated €23m (US\$27m) last year towards the development of its employees in different projects and fields. That breaks down to more than €1,500 per person. “At SEAT, the training and continuous development of the talent of our employees is one of the pillars of our corporate responsibility,” adds Ros. Moving forward, it could also prove a pillar of success.



Connected car features to erase many current pain points

Nick Mavrokordatos explores how connected transport is creating great changes both inside vehicles and on the roadways

The automotive sector is on the brink of innovation and manufacturers are looking to provide their customers with vehicles that can enhance the driving experience. The passenger car segment has seen considerable evolution over the years, but other than digitisation of instruments and dials such as the speedometer, and implementation of GPS which has made it easier to find routes, the overall dashboard design and driver's involvement has remained relatively unchanged over the last century. The development and deployment of the connected car will soon change this—and the transformation will be driven by how users interact with vehicles and the way they communicate with the world around them. From the moment the car door is unlocked to the time it pulls up to the final destination, the vehicle's connected features will enable a fundamentally different experience for the driver and passenger, leaving many of today's current pain points a thing of the past.

Digital assistants like Nio's Nomi could take over many functions

Drivers, data and onboard assistants

The development of onboard digital assistants will do away with many of the buttons and dials that clog up dashboards, allowing both drivers and passengers to control everything by voice, from adjusting the cabin environment to finding the best route for the journey. For the regular trips, connected cars will be able to learn preferred routes. If there are problems reported on the way it'll warn the driver as soon as he gets into the vehicle, offering various alternative routes that still allow for the usual coffee stop. Connected transport could potentially do away with the frustrations of battling traffic jams and unexpected delays.

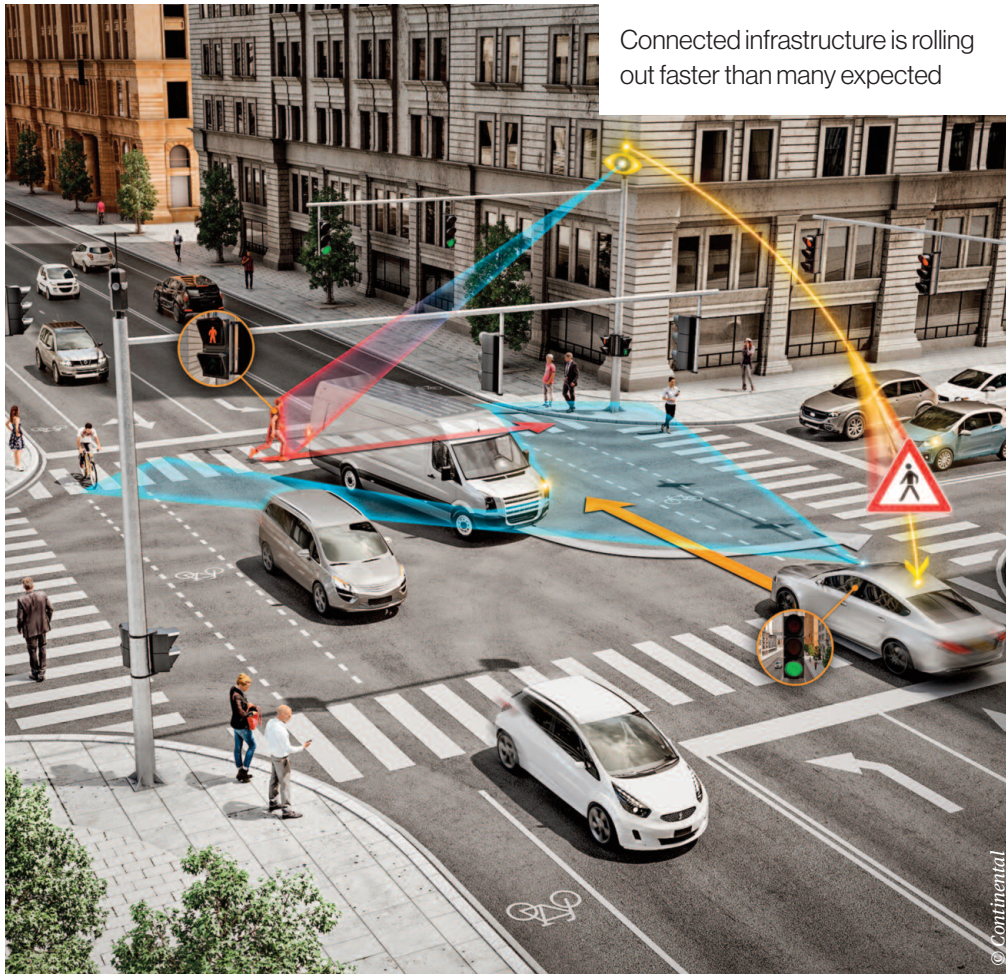
Even if the coast is clear, the car could inform the driver if any outlets enroute have special offers on coffee that day; he may decide to change the route ever so slightly if it means saving a few pennies. From the retailer's perspective, connected vehicles offer new opportunities to directly market to drivers in the immediate vicinity as passengers could even use their journeys to order online shopping via one of the car's displays or voice-detect features. The combination of driver-specific data alongside route preferences will enable the use of highly individualised advertising



based on location, personal habits and vehicle status. This could be used to publicise local retailers and attractions, particularly to people driving in from out of town, helping local businesses to thrive.

And the removal of the need to physically drive a car not only makes us safer but it could move car-use away from mere ownership to a mobility-as-a-service type model. For businesses this opens up the ability to upsell services to customers that are just passing through which could prove crucial when people will have more time at their disposal.

Enhanced connectivity will also mean that in-car entertainment doesn't need to stop once the drive is over, it will become one seamless experience. If an occupant is watching a movie on the car screen and reaches home while it's still



Connected infrastructure is rolling out faster than many expected

streaming, seamless connectivity between the devices means they can start watching it at home from where they left off in the driveway.

Breakdowns and bugs

Enhanced connectivity will also change the way mechanical issues and breakdowns are handled. In the past and sometimes even today, many car owners would just carry on driving when a warning light came on and hope it went away. The centralisation of records and real-time access to telematics and service logs will allow owners and service centres to deal with mechanical issues preemptively. This preventative approach will stop small problems with a vehicle from

snowballing into larger, potentially more costly ones.

Bugs and software errors will be a thing of the past when intelligent connectivity also enables over-the-air software updates, allowing automatic fixing of bugs, and security enhancement. Manufacturers of course need to ensure these updates are rolled out in a thoughtful way, so that the engine software suddenly doesn't start updating while the car is still on the road and results in a complete vehicle failure, risking the passengers' safety.

If more critical breakdowns occur on the road, the always-on connectivity of smart vehicles also ensures detailed information can be accessed no

matter when and where issues occur. This will ensure that drivers are sent to the most suitable, best-equipped service centre for the job. It can also allow for routine maintenance to be more easily scheduled and carried out, while manufacturers will be able to quickly spot more widespread issues with particular vehicle models.

Connected motorways

This connected network will soon extend to roadside signage, traffic control systems and other street furniture. This vehicle-to-everything (V2X) connectivity is coming faster than anyone expected. Just this month the UK announced that it will begin trialling connected infrastructure on its motorways by 2021.

Traffic won't be the only thing flowing more smoothly with more components of the transport infrastructure talking to each other. Insurers will have a much clearer picture of what happened during accidents and collisions, including who was driving each vehicle and which companies have insured the other vehicles involved, while better-informed emergency services and recovery vehicles will be able to respond more efficiently.

The combination of all these data points will offer drivers more relevant, customised services while they're behind the wheel. Having this so readily available opens up opportunities for all parts of the

connected car ecosystem to bring new services to the market more cost-effectively than ever. With the opportunity to get involved in more varying aspects of people's lives like a smartphone does, brands could become much more than just a badge on the front of the bonnet or a third-party logo on the dashboard's touchscreen—they could help to enhance every aspect of the customer's journey.

You cannot plan for the future of connected cars without planning world-class infrastructure. Solutions in the past have relied on physical SIMs—tying owners to one operator for the lifecycle of the car and making updates a challenge. Many believe that a unified approach to connectivity is the only way for drivers, manufacturers and the many other players involved in the automotive industry to realise the full potential of a connected car ecosystem.

A [recent study](#) found that the number of vehicles with embedded connectivity will reach 200 million globally by 2025; rising from 110 million in 2020. As the connected vehicle market continues to grow and evolve, more reliable infrastructure will enable all kinds of highly customised in-car features and services, which will only become more and more useful as more cars get connected. The future of connected transport is bright and is driving us toward great changes not just to our roads, but also how we travel over them.

About the author: Nick Mavrokordatos is Associate Director-Automotive IoT, at Tata Communications

How will artificial intelligence impact automotive IP protection strategies?

As AI becomes more prevalent in the mobility ecosystem, companies may need to become more strategic in how they protect intellectual property.

By Megan Lampinen

Artificial intelligence (AI) is proving pivotal in addressing the complex challenges faced by automotive manufacturers and mobility providers. Systems that can learn for themselves promise to rewrite the rulebook for insurance risk assessment, driver assistance and safety features, and traditional production and product development processes.

Mobility players are investing heavily in the space and—judging by the number of AI-related patent filings—interest is growing. But at the same time, the increased prevalence of AI within the mobility ecosystem could raise issues around intellectual property (IP) strategies. Some legal experts are warning that companies may need to become more strategic in how they protect their IP to maximise business value.

IP protection: a good fit

The World Intellectual Property Organisation characterises the period between 2012 and today as an “AI patent boom” driven by increased data and connectedness along with greater computer power. Of all AI-related patents filed, 42% were in the areas of transportation, telecoms, or life and medical sciences.

Transportation in particular has been powering ahead. The industry represented just 20% of AI applications in 2006. By 2016 it accounted for one-third with more than 8,700 filings. But when it comes to classification areas, the lines are blurred. “Sometimes it is hard to capture the true scope of what AI is, and further, what would be considered to fall within automotive,”

cautions Pavan Agarwal, Partner at international law firm Foley & Lardner.

The trend, though, is clear: momentum is growing. Agarwal works with companies to determine what kind of IP best fits their need. That may involve obtaining a number of patents or protecting something as a copyright or as a trade secret; different aspects of AI are better suited for different forms of protection. Education is often a central feature of these talks. Some software engineers and computer scientists are less familiar with obtaining patents, and the sector has seen some debate over their value. Agarwal comes out squarely on the pro-patent side where it makes sense: “I believe patent protection is valuable to the software industry, and we try to help them understand that.”

When it comes to protection, the focus is on two key areas. The first is the core AI algorithm. “There may be some unique aspects to the nature in which they’re doing the AI itself,” Agarwal explains. The second area of protection is the application of AI to a specific area, such as automotive and autonomous vehicles.

But there are multiple routes down the IP path, and not everyone files patents themselves. Some seek to acquire patents from third parties. It often happens that a start-up company that hit the market a little ahead of its time is forced to wind down operations and decides to offer its patent rights. Companies may also obtain IP through joint development or supply agreements.

“It’s important to look at agreements that exist between collaborating companies,” Agarwal points out. The

Chinese automaker Chery has applied for 19,191 patents and obtained 12,393



form of these collaborations and the companies involved in them have changed considerably over the years. “The automotive industry is quite different than it was a decade ago,” he tells *Automotive World*. “The traditional tier relationships have been disrupted by the entry of numerous technology players, big and small. It’s also been impacted by the change of the car from something primarily mechanical to something closer to a computer on wheels.”

Challenges and opportunities

One of the industry developments that could lead to IP issues down the road is the current cash crunch. The novel coronavirus (COVID-19)

pandemic and the subsequent market downturn has strained liquidity and caused many players to re-examine funding allocation plans. “Companies may have seen their R&D cut and their budgets tightened,” Agarwal points out. “Sometimes it is not so easy to see how filing these patent applications will result in specific value, as opposed to spending the money on sales, which may be seen as directly bringing in immediate revenue. There is always a trade-off in terms of how many patents to file for. They are not inexpensive things to obtain, so that may be an area that proves a challenge.”

The good news for automotive players is that there is still plenty of white space left to capture in the patent landscape, despite the increased

Autonomous driving technology accounts for many AI-related patents

activity lately. This is particularly true for the autonomous vehicle space.

“There are so many ways to come at the problems around autonomous driving, and even areas within that sector like pedestrian detection,” he says. “That allows forward-looking companies to hold a brainstorming session with the engineers and even the business guys to map out where they see the technology being developed. If you can get into a certain white space in that way, then you can file for some protection as you continue to develop that area.” In Agarwal’s experience, brainstorming sessions like this have been a valuable approach for companies to obtain IP rights in a relatively untapped area.

Outlook

Looking ahead, that patent landscape should see considerable activity. Agarwal expects a continued acceleration in patent filings, particularly around the AI space within autonomous vehicle applications. “Autonomous driving relies heavily on data and unique ways of processing data very quickly. We will see tremendous growth in terms of companies developing and then seeking to protect their IP,” he predicts.



However, there’s a flip side to all this development momentum: increased disputes. “Within the autonomous vehicle space, both with AI but also with the connected car regime, we will see more disputes between companies, suppliers, patent owners and perhaps even non-practising entities that want to obtain patents and seek to assert them,” he cautions. “As the area and the revenue associated with it grows, that tends to emerge as a by-product.”



Roadside infrastructure must innovate to support electric, autonomous mobility

The visibility of roadside assets is vital to a realising transformative technologies like EVs and AVs, writes Simon Navin

While most people are acclimatised to it, roadside infrastructure is vital to the safety of transport. From damaged signage to curb drains, the ‘health’ of these ubiquitous assets can have a massive impact on the efficiency of the road networks.

Yet, until now, the technology to effectively track the impact of degradation or damage to roadside infrastructure hasn’t been available to the organisations responsible for installing and maintaining these features, such as local authorities and utilities companies. Absence of such technology, in addition to limiting the management of roadside assets, means that indicators of potential issues with roads and neighbouring utilities could go unnoticed, until an event such as a burst pipe becomes severe enough to draw attention.

Lack of visibility

The cost of maintaining and repairing this damage is also immense—in England, for example, 2019 saw the average highway maintenance budget per local authority rise to [£31.5m \(US\\$40.9m\) a year](#). Further costs to the economy are incurred by the delays these road works and repairs cause to transport networks, preventing drivers from commuting, carrying out deliveries, and [increasing the likelihood of accidents](#) through increased driver frustration and tailgating by cars.

As well as posing a risk to the average road user, lack of visibility of roadside infrastructure could be a major threat to the successful roll-out of transport innovations such as electric vehicles

(EVs). In order to meet global and national [targets for phasing-out gasoline and diesel cars](#), there is an urgent need to upgrade the power grids to support new electricity demand from e-mobility.

Awareness of the current condition of EV infrastructure such as charging points and substations is vital for ensuring the viability of large-scale EV use, and to enable forecasting of network capacity. Inability to identify early indications of water leaks or damage that might lead to power outages could pose a huge risk to the operation of the transport and electric grid. The UK, with 67 million people, would need an estimated [25 million EV charging points to support full-scale national use](#). Detailed insights on the location and concentration of these charging points, as the country grows from its current level of 11,000, would be invaluable for tracking the progression towards the goal of the EV revolution.

Roadside Asset Data Service (RoADS)

A [new service, driven by Britain’s national mapping agency, Ordnance Survey](#), utilises image recognition technology mounted on vehicles to track roadside assets in near real-time, helping to target repairs as well as plan infrastructure investments for technologies such as EVs more effectively. The [world-leading initiative](#) is helping to build ‘intelligent’ road mapping data that both ensures safer and more operational roads, as well as expanding visibility of transport networks for local authorities, utilities, and power companies to manage their assets and enable innovation.

Lack of visibility of roadside infrastructure could be a major threat to the successful roll-out of transport innovations such as EVs



The service can supply detailed, up-to-date information that local authorities and utility companies need for a number of reasons in addition to sending maintenance crews out to the exact location of an asset. The vehicles can monitor construction work and road works that may be taking place for a range of purposes and help prevent damage to third-party infrastructure. It can also locate blocked drains, identify malfunctioning street lights, and alert companies of potential threats to their operation.

The Roadside Asset Data Service (RoADS) programme has seen 100 vehicles fitted with computer vision to carry out automated mapping, with the system trained to recognise objects and monitor their condition. It is like the technology used in many self-driving

cars to visualise the road ahead. Since May 2019, the project has automated the mapping of nearly 2 million roadside features throughout Great Britain—primarily in the North-East of England—using vehicle-mounted cameras as well as other forms of sensor. This is combined with geospatial information from Ordnance Survey to create an unprecedented data service providing visibility of the roadside assets and infrastructure across the country.

The advantages of this initiative are substantial. As the camera and sensor technology is mounted on vehicles that form utility fleets, the extensive mapping takes place as part of the daily, business-as-usual journeys for the partnering organisations. This cross-sector collaboration itself makes

In May 2019, Ordnance Survey and Mobileye announced the launch of trials to create a comprehensive roadside infrastructure dataset of Britain for a new location information service



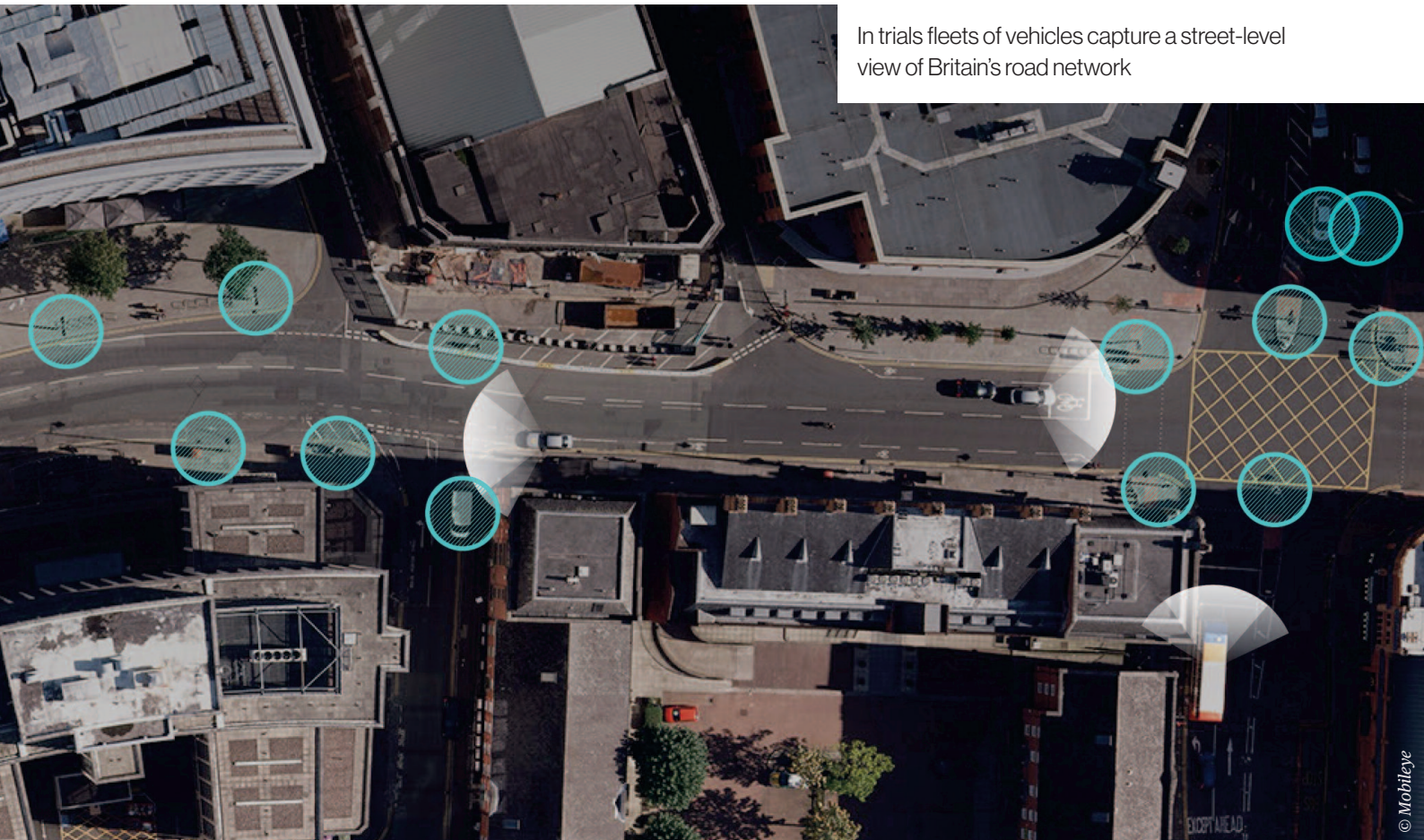
the RoADS project unique. Ordnance Survey is working with Northumbrian Water Group to equip its fleets to carry out this mapping, and it has used the subsequent high-frequency mapping data to its target maintenance activity.

“Accurate and reliable mapping of things like manholes, fire hydrants and valves helps us to be more efficient in our maintenance and repair work by finding things quickly first time, every time,” said Clive Surman-Wells, who leads Innovation Partnerships at Northumbrian Water Group. “We’re looking at how we can improve and complete our asset records by cross-referencing data collected from vehicle-mounted image-recognition systems with Ordnance Survey mapping data and our own asset records.”

Connected cities

RoADS automated mapping may also facilitate the increased demand experienced worldwide for [connections between vehicles and smart city infrastructure](#). The system can help to [highlight collision hotspots](#) and hazards in busy cities by monitoring the physical impact of road accidents. As well as opening the doors to EV roll-out, the project is paving the way for connected and autonomous vehicles. Through the programme the computer vision technology itself is being trialled and subsequently improved, which may have applications in future self-driving cars models. However, it is the high-frequency mapping and computer vision-based data capture which may prove the most valuable

In trials fleets of vehicles capture a street-level view of Britain's road network



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for autonomous vehicles, equipping the self-driving system with up-to-date information to enable safe navigation on roads.

Cutting-edge car manufacturers such [Tesla are already introducing road-sign recognition to their 'autopilot' systems](#). Damage to road signs must be identified and acted upon as quickly as possible or this may lead to a surge of incidents that result from incorrect speed limit detection. The Ordnance Survey's system is already capable of recognising details of roadside assets, from manhole covers and street signs to the function of lampposts and condition of network cable boxes.

The way transport is used and the types of vehicles on roads are undergoing a revolution. It is essential that roadside infrastructure can keep up with the pace of innovation to support the transformative technologies—including EVs and autonomous vehicles—shaping the future of transport. However, it is also vital that transformation in the transport sector is compatible with the other essential networks such as electricity, water, and gas. Cross-industry, collaborative projects like RoADS are only the beginning for future approaches to infrastructure creation and maintenance that will have huge benefits for the stakeholders involved, and create a safer, greener, and more effective network.

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