

Automotive World MAGAZINE

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Ford CTO Ken Washington on smart vehicles in a smart world

Here's **CEO** discusses the importance of location data | A future for **Level 5?** | **Blockchain's** role in future mobility |
Electrification and micromobility in India | **VW's Roberto Cortes** on Brazil's electric truck market |
BorgWarner's Delphi acquisition | **moovel CEO** on multi-modal mobility |

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Editor's note

What does it take to position one of the oldest vehicle manufacturers for a connected, autonomous future? At CES 2020, Megan Lampinen met Ford's Chief Technology Officer, Ken Washington, and put that very question to him.

It's a fascinating topic of discussion—not just for Ford, but for the industry as a whole: at a time when CASE technology is guiding automakers, their suppliers and their customers, how do traditional companies compete with fast-moving, agile start-ups? How do companies that for decades have relied on combustion engine technology and tried-and-tested sales and business models adapt and remain relevant?

Far from being an automotive industry buzz word, CASE is creating a new era of mobility, and the automakers are right to question their place in this new era. From mapping to blockchain, from ride-sharing to next-generation propulsion, connected, autonomous, shared and electrified technologies are forcing a rethink, and success in these fields is there for the taking. Get it right, and the automakers and Tier 1s can use their size, weight and brand equity to secure tech leadership.

In the battle with the automotive industry start-ups, established automakers can also afford to take high-stakes gambles: who'd have expected an electric Mustang, or an electric Hummer?

“Ford is an industry disruptor in the sense that we are disrupting ourselves,” says Ken Washington. Perhaps that's what it takes to position one of the oldest automakers for a CASE future.

Martin Kahl
Editor-in-Chief, Automotive World

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Ford's technology strategy focuses on smart vehicles in a smart world

What does it take to position one of the oldest vehicle manufacturers for a connected, autonomous future? Ford CTO Ken Washington outlines his strategy to Megan Lampinen

Future proofing in the rapidly evolving automotive industry is a tricky balancing act between providing technology that consumers can buy today and investing in the features and functionality that they will require in the future. No matter how deep the corporate pockets, budgets are limited, as is manpower. Backing the wrong technology is an expensive mistake, as zero-

emission, connected and automated vehicles don't come cheap. Predicting mobility trends and perfecting the required technological capabilities isn't easy, but it doesn't take a rocket scientist to steer an innovation strategy. Or does it?

At Ford, this job falls to Ken Washington, who has served as Chief Technology Officer since 2017. Before joining the

automaker he oversaw space science R&D at the Advanced Technology Center at Lockheed Martin Space Systems Company. But the transition from rocket science to autonomous vehicles (AVs) wasn't as significant as might be expected.

"The technology jump was relatively modest," Washington tells *Automotive World*. "The biggest change was the move



Dr. Ken Washington is Vice President, Research and Advanced Engineering and Chief Technology Officer at Ford Motor Company

from a company that didn't interface with the public to one that's consumer facing. When it comes to technology, there is a lot of common ground between spacecraft and cars. They both require advanced materials, they both draw on sensing technology, and they both deal with numerous complex devices that need to work as a system."

The smart world

For the past three years, Washington has been applying his experience to helping Ford prepare its vehicles for a connected, autonomous future. This is a completely different world than the one in which Henry Ford designed his initial offering. Where does a CTO start to tackle the problem? "We start from the inside out," asserts Washington. "We are

future proofing design with technologies like over-the-air (OTA) updates, our next-generation Sync and completely re-architected electrical systems. We are investing to bring new technology into vehicles that can be driven today as well as tomorrow. But technology at Ford is about more than just what's in the car; it is about technology in the smart world."

Ford's City Insights Platform is one example of this mindset. This suite of software tools leverages parking, transit, traffic, safety and census data to help cities explore solutions to urban mobility issues in a dynamic way. The platform was initially piloted with the city of Ann Arbor in Michigan, which used it to analyse parking infrastructure, among other things. The big question was



Ford's City Insights Platform is a suite of advanced software tools that allows cities to explore and help solve a variety of mobility issues taxi service

whether or not the city needed to provide additional parking space to accommodate a growing population. By bringing together a number of different data sources in a single place, the platform allowed planners to visualise traffic flow during an average 24-hour period and see how parking was being used. In the end, they concluded that drivers simply needed to be better informed of what parking was available, a much less expensive endeavour than establishing additional parking lots. Ford recently expanded the use of these tools to six more US cities.

“Ford’s strategy is all about working together to bring great experiences in the future, with more connected, automated and

intelligent vehicles filled with artificial intelligence (AI),” observes Washington. “Smart vehicles working in a smart world is our way of addressing common problems like congestion.” Exponential growth

The automaker has also been working with Microsoft to reimagine traffic in the smart cities of the future. Specifically, researchers from the two companies are looking at ways to harness the power of quantum computing to address congestion. At peak travel period, everyone wants to know the shortest route at the same time, but today’s navigation services don’t take into consideration all the similar requests coming in when they share their routing results. Essentially, these systems respond to each request in a vacuum. The

aim is to devise a more balanced routing system that can consider all the route requests from drivers and optimise route suggestions in a way that minimises the number of vehicles sharing the same roads. The ability to process massive amounts of data would allow for much more balanced routing, which in turn promises smoother traffic flows and reduced emissions. However, traditional computers simply don’t have the computational resources to make that possible. This is where quantum computing can help.

“People tend to think that quantum computing is still ten years away, but I expect that it will happen much faster,” predicts Washington. “It is easy to underestimate the speed of technology. It is moving not



Ford unveiled the Mustang Mach-E at the LA Auto Show in November 2019. Ford’s CTO Ken Washington has called the vehicle an ‘inflection point’ for electric vehicles

linearly but exponentially. Humans tend to think in linear terms. If you try to imagine the speed of the next evolution of technology, you will under-call it, because you'll be thinking linearly. We need to over-call it, and that's what we are doing at Ford when it comes to the next generation of smart vehicles. Through investments like the one with Microsoft, we are trying to pull that forward and think exponentially."

New realms

In a world where technology advances at breakneck pace, there is always room for improvement. At Ford, one of the areas that is being addressed is software. While vehicle purchase decisions were

historically based on body style and engine performance, that is starting to be replaced by advanced driver assistance systems (ADAS) or infotainment offerings. As cars become data centres on wheels, software expertise becomes a 'must have' for automakers. "Ford is still at a very early stage on the software journey," concedes Washington. "We are bringing new talent to the company, learning to build software in new ways and working with it differently. I expect that effort to grow and expand, allowing us to build new capabilities so we can do great things like electric pick-ups and the Mustang Mach E."

The Mach E is an all new electric SUV, a first for the Mustang badge. Described by Washington

as the company's smartest vehicle yet, the newest Mustang features a hefty dose of ADAS and smart technology. Washington believes that incorporating the sort of connected functionality that people desire into an electric vehicle (EV) could prove a big stimulus for the wider EV industry. "The Mach E is the start of that," he adds.

It's also a big gamble. As many industry analysts have pointed out, applying the iconic Mustang label to this futuristic, zero-emission model may not go down with loyal brand fans. If it's a success, then Ford could reap serious rewards across the board and reinforce its role as a true mobility brand for the future. "If it falls short, the company will have another Edsel on its hands," cautions Michael Harley,



Executive Editor for Kelley Blue Book, referring to Ford's failed marque of the late 1950s.

Ford is no stranger to failed ventures in its path to future mobility. Last October it announced that the Chariot shuttle service, acquired in 2016, would be wound down by the end of the first quarter this year. As Chariot Chief Executive Dan Grossman explained: "In today's mobility landscape, the wants and needs of customers and cities are changing rapidly. As those changes continue, it has become clear that the mobility services delivered by Chariot over the past five years

will not be a sustainable solution going forward." Two months later, Ford announced that it was also ending the GoRide Health medical transportation service.

Predictions

Setbacks like these have not dampened the automaker's bullish outlook for the industry's—and its own—advancement in the coming decade. "By the end of the 2020s, we will see vehicles intelligently working in collaboration with the smart world," predicts Washington.



Ford is promoting the technological advances in the all-electric Mustang Mach-E





Ford's Argo AI unit currently operates a test fleet of around 100 autonomous vehicles in three locations: Miami-Dade County, Washington, D.C. and most recently, Austin, Texas

“And by ‘smart world’, I mean one in which everything is smart. By this time, 5G will be commonplace and vehicles, people, scooters, bikes and stop lights will all interact with each other.”

Autonomous driving will also make notable headway on the roads. Ford itself is planning to launch a fully automated vehicle in commercial service by 2021. “In five to ten years, the autonomous future that we all crave will be closer to reality,” he adds. “While there will be fully autonomous vehicles in this time, the nature of those AVs will be different than we imagine today. People will undercall the arc of technology. We think of AVs as linear, with LiDAR on top and a supercomputer in the trunk. I think it will be different. I see new sensing modalities, with

sensing moving to the cloud and edge computing. Sensing will happen more collaboratively.”

Notably, he believes that AVs will not be limited to shared mobility fleets but will also be owned by private individuals. But Ford’s not counting on private vehicle ownership to remain relevant in this evolving mobility ecosystem. “We are betting on Ford to develop lasting and enduring relationships,” asserts Washington. For this, the mobility app Ford Pass will be pivotal. Free to download, the app provides users with access to general mobility services as well as owner services for Ford-specific models. Sheryl Connelly, the automaker’s futurist for more than a decade, has spoken of Ford Pass as a means to “reach people who don’t plan to ever own a car.”

Washington echoes this sentiment, noting how the app “provides a customer relationship with Ford regardless of whether an individual is in the car or not. It serves as a connection to the company.” Ford Pass essentially creates a link between an individual’s smart home and their journey.

Washington goes on to suggest that in its own way, Ford is proving as disruptive an industry influence as some of today’s new mobility players. “Ford is an industry disruptor in the sense that we are disrupting ourselves,” he insists. The company has certainly shown a recognition that a new mindset is needed, and its determination to maintain the consumer connection in new and innovative ways could be lifesaving in this emerging realm of shared, multi-modal mobility.

VW e-Delivery could kick-start Brazil's electric CV market

Roberto Cortes, CEO of VW Caminhões e Ônibus speaks to Megan Lampinen about recent efforts to promote electrification in the Brazilian commercial vehicle sector





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Our strategy was to develop a new vehicle that could work with a diesel internal combustion engine as well as an electric propulsion system

*Roberto Cortes
VW Caminhões e Ônibus*

Brazil's automotive industry has long championed ethanol, but could it emerge as a pioneer in electrification? VW Caminhões e Ônibus (VWCO) is doing its bit to make that happen, and the Traton Group company has been investing heavily in local R&D and manufacturing to support its vision of an electric future. In December, it announced a Real 110.8m (US\$26.5m) infusion to support the production and launch of the new e-Delivery truck.

The Delivery model has been one of the top sellers in its segment in Brazil for the past nearly 30 years. Work began in 2015 to design the next generation. “It was a big

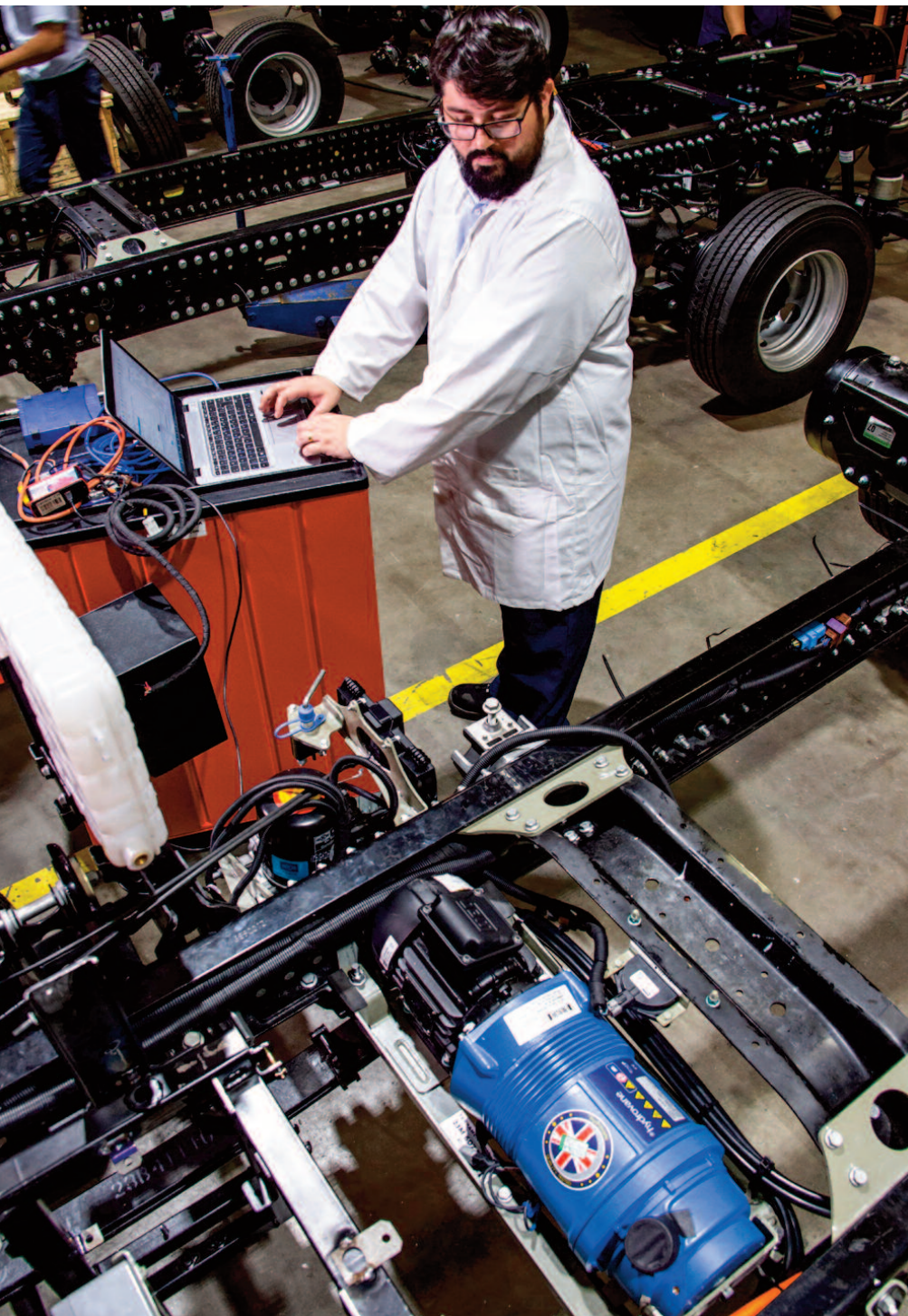
responsibility to replace such a champion model,” observes Roberto Cortes, the company's President and Chief Executive. “During development, we realised that by the time the vehicle launched, we could contemplate an electric version. Our strategy was to develop a new vehicle that could work with a diesel internal combustion engine (ICE) as well as an electric propulsion system. This is a big difference from simply converting an ICE to an all-electric set-up.”

A brand first

Beverage company Ambev has been trialling the electric trucks with good results; so good, in fact, that it now intends to purchase a

total of 1,600 e-Delivery units. It will be the first customer to receive the e-Delivery once production begins, though Cortes says that the company has “a long list of other potential customers that are asking us about this.” At the moment, there are 17 prototype e-Deliveries undergoing validation and testing on the automaker's test track. The use of simulation testing is speeding things up—VWCO engineers are able to simulate the equivalent of ten years of normal driving conditions in just six months.

Full-scale production of the electric version is scheduled for the second half of 2020, with deliveries to begin in 2021. VWCO's Resende plant pioneered the unique supply chain model known as the Modular



Members of the e-Consortium share the responsibility for assembling the trucks in Brazil

management. For example, CATL provides battery packs, Brazilian company WEG provides motors, Bosch supplies electronic control modules, and axles come from Meritor. Moura will oversee the logistics involved, while Siemens has been evaluating plans for installing EV chargers in the factory.

A good fit

The Delivery has always been targeted at urban delivery applications, a good match in general for electrification. Fleet companies operating in this space frequently operate on a return to base model, allowing for charging back at the depot and reducing their reliance on public infrastructure. They also tend to run repetitive, predictable routes with limited mileage. VWCO estimates that the e-Delivery can cover 200 kilometres (124 miles) between charges, drawing on a 170-kWh battery.

With no noise or emissions, these vehicles can operate through the night and in regions that may be out of bounds to noisy, higher-emission models. EVs in general promise easier, less expensive maintenance than their ICE counterparts, and the running costs are cheaper. While the e-Delivery will carry a higher initial

Consortium, in which it worked closely with a small number of key suppliers. By delegating responsibility for large modules to each supplier, it dramatically reduces its supply chain complexity. The company is now expanding this concept for the production of EVs, starting with the e-Delivery. “We are working with some suppliers in order to

produce the electric trucks, just like we have today with ICE vehicles, but we are also working together in the development phase,” explains Cortes.

Known as the e-Consortium, this business model covers manufacturing and assembly as well as recharging infrastructure and battery lifecycle

price tag than its diesel counterpart, operators can expect to make that back in three to four years, according to Cortes. In the first year of pilot testing by Ambev in São Paulo, the vehicle covered more than 15,000km and saved more than 3,300 litres of diesel fuel, avoiding around 11 tons of CO2 emissions.

Brazilian challenge

But just how good a fit is electrification for the Brazilian market? After all, the industry has relied heavily on ethanol for many years. However, recent moves suggest there is considerable potential for EVs. The ROTA 2030 auto industry

supported by subsidised financing from BNDES, Brazil's national development bank. Cortes also plans to visit the Ministers of Economy and the Environment to show them the benefits of electric transport. "I am not asking the government to install charging infrastructure across the country," he clarifies. "I don't need



The e-Delivery is still undergoing testing but deliveries should begin in 2021

"Each day, we become more sure that that is the right decision," he tells *Automotive World*. "Not that the electric version will totally replace the diesel one—in fact, I think diesel will stick around for many years—but in urban applications there are simply so many benefits." Long-haul, though, may not be such an easy nut to crack. "When you go from the south of Brazil to the jungle, it's a different ballgame entirely," Cortes cautions. "You need infrastructure. Also, for the long-haul segment diesel is still economically viable, so it's more of a challenge on the TCO front."

policy lowers the rate on the IPI industrialised goods tax for full-electric and hybrid vehicles from 25% to 7-20%. It also encourages better fuel efficiency and stimulates R&D, but many have complained it falls short of what is needed to push uptake.

"We are doing our portion by starting with the development of electric models," said Cortes. "Beyond that, I am personally reaching out to make contact with the government. The first meeting I had was with the President of the BNDES, and with him I secured the incentivised financing for our project." VWCO's investment in the e-Delivery is

subsidising. I only need some promotion, some incentives. This is a one-person journey at the moment, as I am the only one doing this in the country."

Despite the challenge, Cortes believes that recent economic developments will prove favourable to the cause: "After a very difficult period, the whole Brazilian economy and the auto sector are both recovering. This comes at the right time as we are exploring new areas and new products. This improving economic environment is good for companies like us that are investing in new technology and in our business."



COMMENT:

Tesla's US\$89bn valuation highlights importance of hype and hope

The perceived strength of a company is based on core financials, but Tesla has proven that hype still carries serious weight with investors. By Freddie Holmes

Tesla's rise from hopeful start-up to the most sought-after electric vehicle (EV) brand in the world is mightily impressive. On 8 January, the company was considered more valuable than both Ford and General Motors combined, with a market cap of US\$89bn. How can a company that has struggled to achieve profitability since its inception possibly be worth more than two of the automotive industry's biggest names?

From the opinion-splitting pick-up and battery-electric semi-truck, to the ongoing promise of 'full self-driving' functionality, Tesla continues to present the idea that the company is just getting started. But with the recent launch of its factory in China and record deliveries in Q4 2019, efforts are

under way to assure analysts that there is more to this tale than just hype and hope. Then there is the Model Y, which is slated for production at the Fremont plant in the summer; Elon Musk has suggested the latest model in the line-up could outsell the Model S, Model X and Model 3 combined.

Now an established vehicle manufacturer, Tesla is mixing it with the best in the industry. It may present as a start-up, but today it is just another car company. Each new customer means a couple of tonnes of materials need to be processed, assembled and delivered on time, and ideally with a profit margin to support continued growth.

In Q4 2019, Tesla delivered 112,000 vehicles thanks to a carry-over of inventory. That quarter,

Ford sold 601,862 new vehicles in the US alone, of which 330,075 were trucks and 208,387 SUVs. In September, the average transaction price of a new Ford vehicle in the US was US\$37,900, comparable to the entry level Model 3. Of course, it should not come as a surprise that Ford currently sells more vehicles. What it does show is that today's investor community is no longer laser-focused on production figures alone.

There are a number of considerations behind a company's valuation, ranging from core financials—revenue, GAAP profit, etc.—to corporate management and of course, hype. Above all, a valuation should fairly represent the company's economic value, and should consider all elements of the



business and its operations. This is where the comparison with Ford and General Motors becomes tricky; the established automakers have long suffered from the decline of new vehicle markets in South America and Russia, for example. Tesla does not have such legacy issues to drag down its quarterly results.

Of course, Ford has not had a particularly positive story of late—and there has been little hype to make up for it. Senior management has chopped and changed in recent years, and its strategy to address ‘future mobility’ needs have drawn the ire of shareholders. The acquisition of an e-scooter company came at a time when the company announced it

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Tesla’s valuation may currently dwarf two of the automotive industry’s biggest names combined, but it is important to remember how volatile those figures can be

would be focusing mainly on SUVs; its mobility service Chariot is being dissolved; and in December it was reported

that its private ambulance service GoRide Health is also getting the chop. The fully electric Mustang-branded Mach E has helped to bring the automaker back in the fight, but the branding decision has ruffled the feathers of some fans.

Tesla’s valuation may currently dwarf two of the automotive industry’s biggest names combined, but [it is important to remember how volatile those figures can be](#). The company’s success has partly been due to the fact that it is a unique proposition. Once more smart, electric vehicles hit the market, it will be interesting to see how that valuation holds up. And if profits do not begin to show some consistency, another money dance may be in order.

Beyond mapping: location platform technology underpins the smart world

Here's CEO speaks to Megan Lampinen about the concept of location and its potential to transform the mobility ecosystem

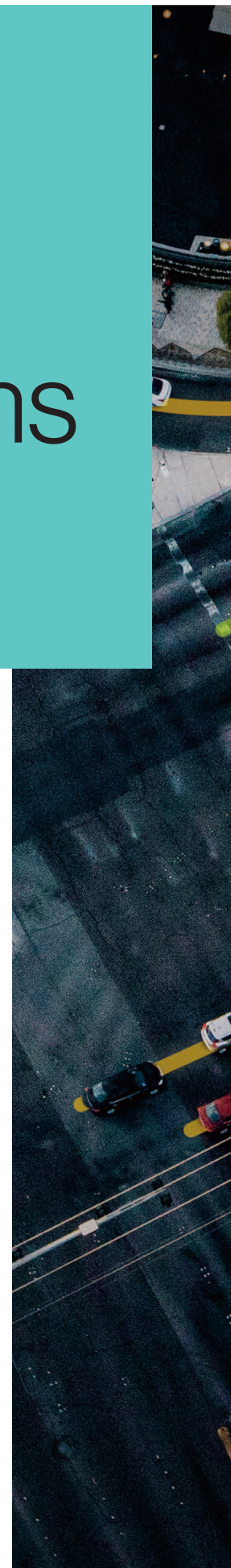
Location data underpins many of today's advanced driver assistance features and paves the way for a future of autonomous driving.

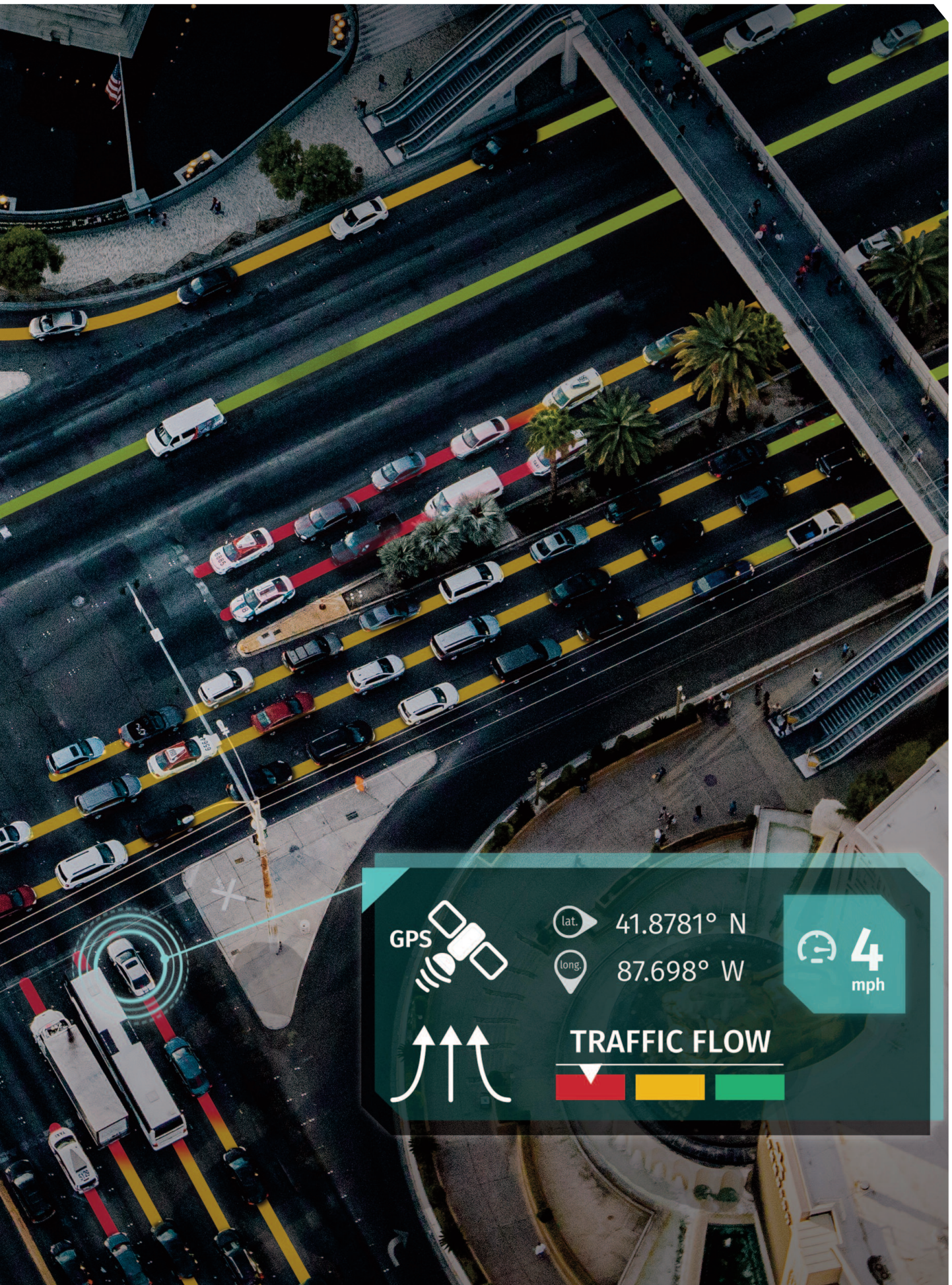
Over the past few years, Here Technologies has been developing beyond its mapping origins to become a location data and technology platform, not only helping drivers to reach their destinations but also cities to manage their infrastructure and fleets to optimise their assets. Overseeing this strategic transition is Chief Executive Edzard Overbeek, who describes the company as the NASDAQ for location data.

"We offer a neutral platform on which to trade data. Anyone can join, even a competitor," he explains. "We are multi-cloud—you want Azure, that's fine, if you

want NTT that's fine too. The customer decides. And you own your own data; it is yours, not ours."

This new, wider focus on location platform technology represents the most significant development the company has undergone since Overbeek joined in spring 2016. As he tells *Automotive World*: "We have gone from a traditional mapping provider to a true technology company. When I came on board, we prided ourselves on building the best map. That is still important, but today we pride ourselves on having the best location data, one format of which is the map. We use this location data through a platform to service multiple industries and use cases, which gives this company a unique position."





The Holy Grail

Here's evolution is far from over. The company claims to have 48 use cases across multiple industries, and the number is growing. It kicked off 2020 with a slew of new product and partnership announcements. The Here Navigation On-Demand solution is now ready for full automaker programme deployment, promising an embedded navigation experience that is dynamic and upgradable. Here Lanes is also launching, offering 3D road models that help vehicles to position themselves within a lane and providing drivers with lane-level visual guidance. For fleets, Here Last Mile is assisting with vehicle and driver optimisation while working with constraints such as delivery windows and cost.

In addition, two new APIs (Application Programming Interfaces), Here Public Transit

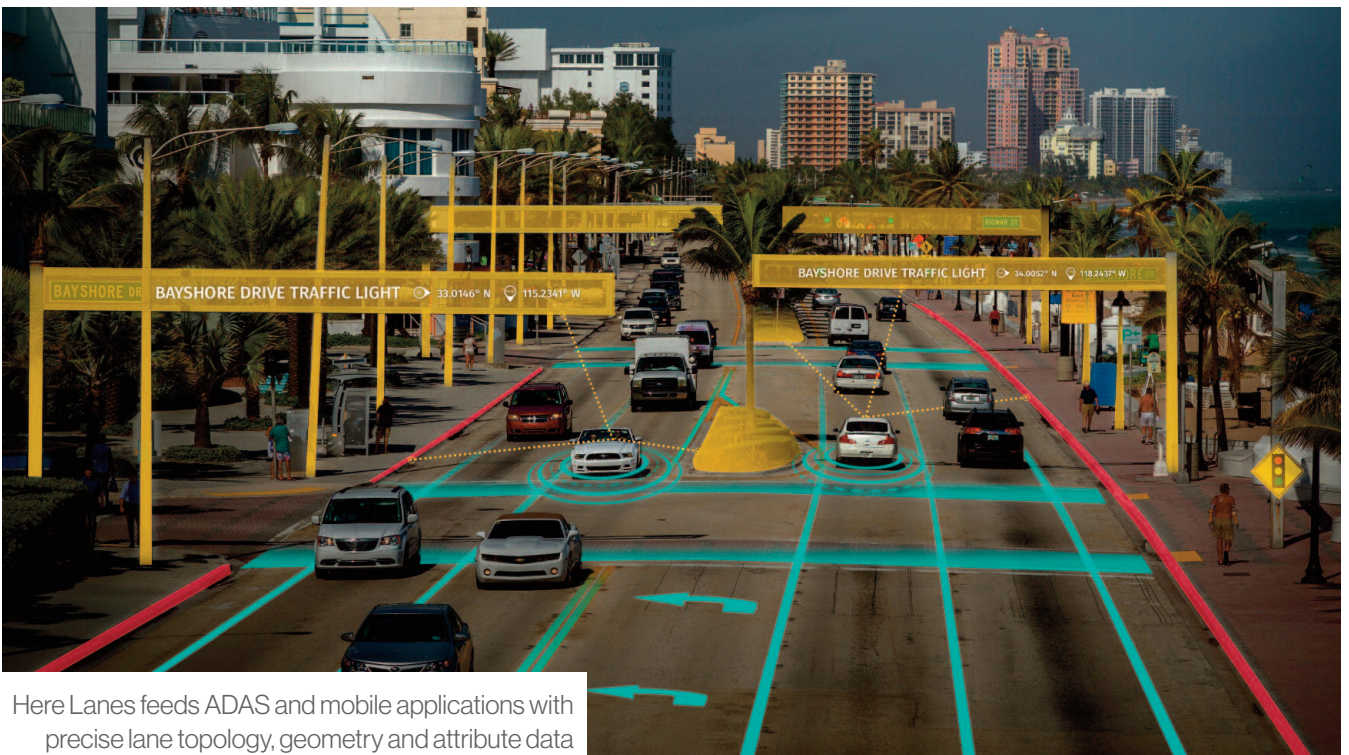
the door to explore applications of its 5G network and multi-access edge compute platforms.

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We have been looking for Asian partners, and when it comes to Asia you have two choices: Japan or China. China comes with a whole bunch of complexities

and Here Intermodal, are now available for organisations incorporating commuter-friendly routing for various transport modes into their applications. Meanwhile, a strategic partnership with Verizon opens

These are just a tiny sample of the numerous steps Here is taking to advance towards the end goal of location data services. For Overbeek, this is all about the elimination of waste: “The best way to think about the Holy Grail



Here Lanes feeds ADAS and mobile applications with precise lane topology, geometry and attribute data



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The challenge isn't so much a lack of data but rather gaining access to the right data and then building solutions that create business opportunities

here is to eliminate waste. In a single square mile, there are many different dynamic things happening, but they are all disconnected systems.” For example, the bus on which a commuter is riding does not know when it will arrive at the station. When the traveller steps out of the bus, he may have a long wait for the train he needs to catch.

“There's no optimisation, which is waste in the form of lost time,” elaborates Overbeek. “You can address this if you start to use location as the foundation for everything. It boils down to the space-time conundrum. We can start to say within that square mile, we know what happens and how we can optimise movement. The biggest thing we can do with transport is to eliminate waste.”

Data

Data is at the heart of Here's offering, and Overbeek believes that transparency in where and how it uses data will become a fundamental differentiator. He attributes the company's current stance on this area to its Nokia roots: “Nokia did a fantastic job, starting with simple things. When you download something in the Nokia domain, you are always opted out as standard, where others automatically opt a user in. We have been building on that.”

Notably, Here's investor companies, particularly the likes of Daimler, Audi and BMW, provide the supplier with a rich data flow from their vehicles. But volume alone doesn't make data valuable. In fact, too much of it can become a liability, as

Overbeek explains: “People in the data game quickly realise there is no lack of data. Many make the crucial mistake of storing every data piece into the cloud, resulting in a massive bill and no revenue. The art is gaining access to the right data and then building solutions that create business opportunities.”

Here has that with the automakers and other investors. It also has access to 84,000 sources for data sets worldwide, both dynamic and static, including local entities, public transport providers and government feeds. “Then there are the new datasets coming in from new OEMs, not just the investors. They are trading in the market place,” he points out. “Think of IoT data and machines providing data. My job is to make sure that I'm not

overspending on my storage and compute capacity. That's the tricky thing. It's nice to receive data sets that your scientists can play with, but then you get hit with a US\$1.5m bill."

Spotlight on Asia

Here traces its roots back to US company Navteq, which was acquired by Finland's Nokia in 2007. It is now majority-owned by a consortium of German automotive companies and headquartered in Amsterdam. However, its ambitions are global, with a particularly strong interest in Asia. "We have been looking for Asian partners, and when it comes to Asia you have two choices: Japan or China," notes Overbeek. "China comes with a whole bunch of complexities." Today, Here provides maps to Chinese companies Tencent, Alibaba and Baidu, but they are only for countries outside of China. These players provide their own domestic market maps.

In light of the restrictions imposed by China, Here decided to pursue Japanese investment through a number of key partnerships. "There is so much opportunity in Asia-Pacific, and Japan in particular," says Overbeek. He spent many years in Japan as President of Cisco's Asia Pacific, Japan and Greater China region and during this time built up numerous relationships.

Here has been working with Japanese tech giant Pioneer's mapping subsidiary Increment P to develop high resolution maps and location data services. In

2017, Here and Pioneer agreed to take a small investment in each other. "Pioneer was a deliberate choice for a partner," he says. "Its mapping activity had the closest technological resemblance to the formats Here is using. Together in the one map alliance we can create a better mapping product that truly has global scale. If you make a deal with us today, we are compliant in China, Japan and South Korea. Rather than compile four times, we do it once and

simply scale it out. This has massive cost savings implications for automakers."

In December 2019, Mitsubishi Corporation and NTT announced plans to jointly invest in a 30% stake in Here through a newly established joint holding firm COCO Tech Holding. A few weeks later, HERE outlined plans to work with Mitsubishi on several project areas, including truck logistics, last-mile delivery, smart city initiatives





and mobile navigation within indoor environments like airports. “Our conversations with Mitsubishi began around the commercial end first, and we saw tremendous opportunities. It became clear that this is the right investment portfolio in terms of geography, technology and commercial potential.” The Mitsubishi and NTT agreements remain in the closing period, and Here expects to finalise the deal at the end of the first or second quarter this year.

Another potential partnership in Japan could be on the cards. The country is home to the Dynamic Map Platform, funded by a consortium of Japanese companies including Toyota, Honda, Nissan, Mazda and the government-backed Innovation Network Corporation of Japan. Overbeek has met with the consortium several times. When pressed as to the potential match between their efforts and Here’s ambitions, he replies: “I think

there’s considerable opportunity in the concept of partnership and to start thinking through a more global approach. Our efforts to build a high-definition product for Japan fit with the technology they are doing. They also realise this is not just for cars, but also for drones, advanced robotics, etc. For that reason they would be interested in a partner, certainly for North America and Europe. We would also be interested.”



Smart software secures public transit's place in multi-modal future

**The Chief Executive of moovel speaks to Megan Lampinen
about the company's contribution to a multi-modal ecosystem**



ride-hailing, parking, electric vehicle charging and multi-modal and public transport.

In North America, the multi-modal and public transport activities operate under the moovel brand, with a European counterpart known as Reach Now. As moovel's Chief Executive Jose Valera explains, the primary focus in North America is providing software for public transit companies, helping them increase ridership and integrate with other mobility service providers. He has a clear vision of a multi-modal future, in which data and software underpin a seamless, convenient transport environment.

Connected technology and new business models are reshaping the mobility industry. What sort of changes have you observed in the past few years?

We have seen almost a full cycle of development in the mobility industry, and this goes for public transit, micro mobility and trip planning. About five years ago there was a real frenzy with respect to start-ups in the mobility space. With trip planning and mobile payments there was RideScout, GlobeSherpa, Moovit and Masabi. On the ride-hailing side we had Uber and Lyft, and with car-sharing there was car2go and Reach Now. All of these companies emerged around the five-year mark, some have been around a little bit longer, some a little bit less. Scooters were the latest entry into the mobility space, which was a little bit of a surprise.

Has this flurry of activity begun to stabilise?

Yes, we are now starting to see it mature. Players are focusing more on accountability, profitability, and sustainability, but there will always be something new that comes in and surprises us, like the scooters.

Several new mobility trends have emerged over the past few years. Which ones have the biggest impact on moovel and its business model?

Our recent Top Ten Mobility Trends report found that transit ridership is on the decline in most US cities. We also flagged how transit agencies and mobility service providers are creating an ecosystem of transportation options that can compete with private car ownership. We partner with public transit, and are obviously a strong believer in it. Even as we have pushed the narrative of mobility as a service (MaaS) and multi-modal journeys, our core has always been public transit. It still remains the number one way to move people. It is also very much a public good, representing the most equitable way to move people—all people, despite economic class.

As a private software provider, how can you help with the public transit challenge?

We want to do our part to make the user experience really great, and to help educate government entities on how to engage with the user, how to help riders have a positive experience when they pay, when they search for their

Traditional car manufacturers are scrambling to reposition themselves as mobility providers, exploring alternative forms of transportation and new business models. This is still relatively new ground for all players, and scale brings big advantages. Two years ago, BMW Group and Daimler AG set aside their rivalry and announced plans to merge their urban mobility services. Today, these take the form of several different businesses active in car-sharing,

rides and when they board. The important part is to assist the agencies with the data that we can collect. It is ultimately their data, and we want to be able to package it, bundle it, and give it to them in a way to help inform decision making. An agency may be wondering whether or not it needs express lanes or where services should be provided within a city.

Some MaaS companies are starting to examine ways for riders to book public transport rides as well. Is multi-modal mobility likely to characterise the transport ecosystem of the future?

There will be greater cooperation between schemes like ride-hailing and public transport. We are building out an ecosystem for

transit connections. Private companies are focused on the ecosystem that they want to build within their applications. After many years, they are changing their message and their approach to public transport and taking a positive spin.

Do you see moovel as a middle man between the two?

We really can be a bit of a middle person as we have great relationships with public transport, but ultimately they are our clients. Our role is to help bureaus of transportation and cities continue to play a major role in the mobility revolution. Part of that is to make sure that this positive intent from the MaaS players is followed through and equip the transit agencies with tools to understand how the

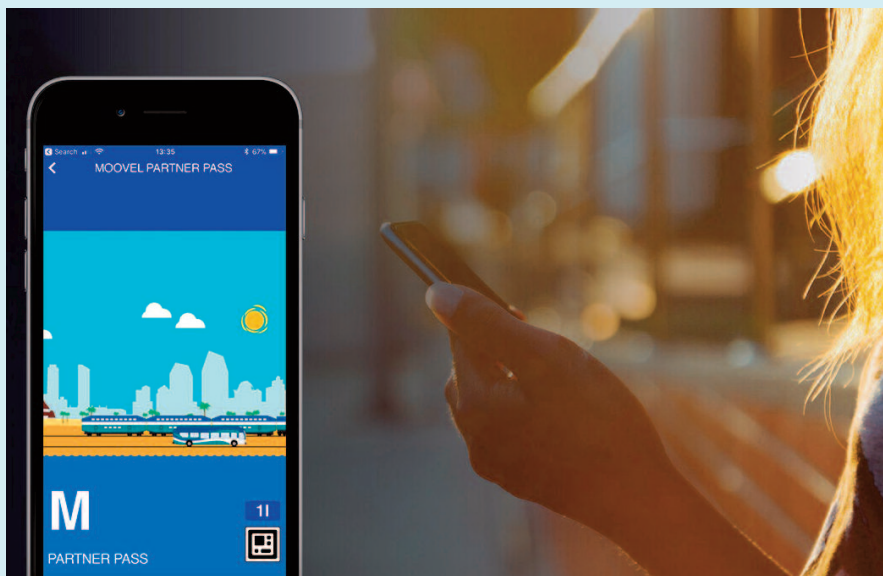
How would you define the relationship between public transit agencies and cities?

A single transit agency is one part of the whole city. No matter how progressive they want to be, they need the cooperation of departments of transportation and city management. Ultimately, they have to be aligned to have a truly holistic approach.

Can you highlight any regions or players that are leading the way, setting a template for others?

Cities like Seattle, Houston and Austin are really putting the user first. The Los Angeles Department of Transportation is another great example of a transit agency deciding that it

Metro Transit is partnering with moovel in North America to pilot a new mobile app that will allow Metro Transit customers to purchase transit fares direct to their mobile device



multi-modal and starting to link the different providers. Whether it's Uber, Lyft, Share Now or Free Now, the important thing is to engage and build those public

private companies operate, to understand the types of data available to them, and help them build solutions that interface with the likes of Uber and Lyft.

needs to operate like a product company. These players need to think about the users' needs and problems, and they need to be flexible about their approach.

Do you see public transport remaining the backbone of mobility throughout this new decade?

I think it has to be. This is confirmed by real-life examples where we've tried to implement full

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MaaS bundles various types of public transportation, such as buses, subway, car-sharing, bike-sharing, and taxis, to form a multimodal mobility solution

MaaS, as in Finland with MaaS Global's Whim service. When there's a limited role for public transit, ultimately there's a limited effectiveness of the multi-modal ecosystem. Public transport has to be the backbone, as it remains the most efficient and equitable way to move people.

The industry has seen a number of new players emerge on the shared mobility scene. Do you expect to see some consolidation moving forward?

Speaking to the North American market, as that's where I'm focused, I think we'll see consolidation. We are already seeing some of the micro-mobility start-ups going away, and we've

seen some in the car-sharing space as well. Businesses that engage in this shared mobility revolution ultimately have to be profitable and sustainable. I think we will start to see a fading of this willingness just to pour what seems like unlimited funds into

new pursuits. With that will come greater focus on fiscal responsibility and sustainable business, and that inevitably leads to some level of consolidation.

What's missing in today's mobility industry? What does it need to help it reach its full potential?

To make notable strides forward, we need to introduce federal standards on data sharing for public entities to private entities. That really slows down the process as we engage agency by agency. State agencies are subject to quite a few state regulations on how they use their data, especially in more protected states like California. It would be great to have federal guidelines on

data sharing, so that everyone knows how it should work.

I imagine data sharing will only become more pivotal as the industry becomes increasingly multi-modal?

You definitely need data sharing to be able to create a journey for a user and pass him or her from one mobility service provider to the next, all the while ensuring a good user experience. You also need to be able to pass on the ability to charge that customer for multiple services. As soon as you start moving

money and payment credentials, you trigger money transmission, regulations, fintech regulations, banking regulations in general, and it becomes quite a barrier to creating a full multi-modal ecosystem.

What's the key for public transit, and for moovel, to remain relevant?

Both of us have to be willing to take some risks, whether it's the way we handle payments or the way we create innovative business models on revenue sharing. We need to think about how to keep government relevant, how to be able to take more risks in public/private partnerships, and to ensure we are able to keep pace with the industry.

Interview: Chris Ballinger, CEO, Mobility Open Blockchain Initiative (MOBI)

Vehicle identity standards will prove the backbone of smart mobility services in increasingly crowded cities, says MOBI.
By Xavier Boucherat

Cryptocurrency has made a star of blockchain technology in recent years: whilst the future of Bitcoin et al is unclear, many have predicted that distributed ledger technology will be pivotal across a range of industries. However, a wider rollout has proven slow. As *Bloomberg* columnist Noah Smith wrote in May 2019, blockchains remain high cost solutions facing big competition, including from other blockchains, and whilst they could some day change the world, “there’s also a chance they could prove useless.”

But a study by IBM found that 62% of automotive industry executives believe the technology will prove disruptive, and patents

are already being secured. The growth of the Mobility Open Blockchain Initiative (MOBI), a consortium of automakers, tech giants and start-ups, further demonstrates interest. As MOBI notes, if blockchain is slow to roll out, it is due in part to the lack of scale and common standards: issues which an industry-wide group would hope to address. Founded in May 2018 with 35 members, the organisation has since almost quadrupled in size. GM, BMW, Renault Group, Ford, Honda and Bosch are all members, all of whom participate in different working groups on potential applications where blockchain could play a role, including usage-based insurance, electric vehicles and grid integration. But most essential of all will be the creation of vehicle identities (VID).

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We could do this today, if everybody agreed. There is a parallel with the development of the internet, in that the technology existed way before there was any agreement on protocol, or before it became useful in people's lives

Chris Ballinger
MOBI



Chris Ballinger is Founder and Chief Executive at MOBI. In a recent interview with this publication, he began by outlining the importance of VID. Moving forward, it could birth intelligent mobility networks that fund infrastructure in radical new ways, as well as incentivise greener driving, shared mobility and other healthy behaviours at a time of ongoing urbanisation. In collaboration with its automaker partners, the group recently announced it is now developing the world's first proof of concept for blockchain-based vehicle identity.

What is the importance of VID, and what is the relationship to blockchain?

Simply put, things have to be able to identify themselves if they are going to interact with each other, particularly if they are going to make payments and be part of an economy such as vehicle to everything (V2X) technology. It's incredibly important because MOBI believes vehicles will be making autonomous payments with tokens from vehicle wallets long before they're driving themselves, for everything from road

infrastructure to parking spaces. VID will allow infrastructure operators to solve some of the intractable problems they face today using pricing mechanisms and markets. Congestion pricing is an obvious example that every city is looking at.

There is already one example of a widely-used distributed network in the world: the internet. Shortly, we will have the ability to exchange things of value in a distributed way. Bitcoin is essentially the first application of this. Important actors in this ecosystem will

include machines and devices, like vehicles. Having an ID and a means of payment allows them to be part of a transaction economy. Without that ID, they cannot be part of an economy. It's the same for people: you need a bank account, and without ID you cannot have that bank account. It is the basic requirement: to be able to coordinate their behaviour,

security. We've seen big problems in the IoT space already because of insufficient security and identity, including attacks on infrastructure. In these situations, anything on an IoT network becomes a vector for attacks and fraud. If you look at the internet, the current statistics show that around 50% of internet traffic is bots, and 60% of that is malicious. Humans

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It doesn't exactly matter what the standards are. What's important is that they exist, otherwise it's chaos. If every manufacturer had its own way, then infrastructure providers simply will not make the investment required

buy or sell data, or pay for roads. A secure and trusted way of identifying who it is that you're dealing with is the first and most important requirement, and that is what blockchain provides.

are pretty good at knowing what to trust online and what not to trust, but it's hard for a machine to figure out that, for example, a prince in your emails isn't really a prince.

So smart cities, for example, will be dependent on VIDs and blockchain?

It's hard to imagine a smart city without having a way of identifying what's out there, and the issue is really

Without VID, smart city applications like traffic lights or congestion management present opportunities for fraud with potentially catastrophic consequences, particularly as we move towards autonomy.

Smart cities are often associated with mobility as a service (MaaS). How will blockchain better enable options like car-sharing or ride-hailing?

If a vehicle has a secure identity, you can imagine that vehicle buying and selling services including renting itself out for car-sharing, renting a seat out for ride-hailing and car-pooling, or even space in the trunk for moving goods. If you think about MaaS, the key is really achieving maximum utilisation. Fleet operators are having to work with a business model that's more akin to the airline business, where every minute spent on the ground is money lost.

Having a VID allows the vehicle to be monetised more easily. Along with these new services, it allows for the sale of data and usage-based insurance according to the exact service it is providing. None of this is possible without being able to securely identify a vehicle and what it's doing, minute-by-minute: IDs combined with smart contracts and GPS-based real-time location.

Another related consideration is road-usage, which will become especially important as cities begin optimising congestion pricing. They might do things like prohibit Ubers from

travelling through school-zones prior to 08:30am when children are being dropped off, or they might raise the price of these services.

So VIDs could encourage better, more responsible driving practices in cities?

Yes, they could create incentives to route traffic in more socially desirable ways, avoiding congestion. It's very difficult to do that with the tools we have today, such as the gas tax, which is such a blunt instrument that all it can really incentivise is less driving. Secure digital identities could allow finely tuned incentives that cities can use to address some of their specific problems, like emissions.

For example, a smart contract in the car pays for road usage, adds the congestion charge where required, receives credits if it's a hybrid or electric vehicle, or pays a fee if it is a gas guzzler. Slightly higher insurance payments might be made in accident-prone areas, or at accident-prone times. Importantly, all these things can be bundled together, which is far more efficient than doing it across multiple payment platforms, especially when you consider these are micropayments involving fractions of pennies.

What are the main challenges in rolling out blockchain across the automotive sector?

Perhaps the biggest obstacle is standards: what's worth noting is that it doesn't exactly matter what the standards are. What's important is that they exist, otherwise it's chaos. If every manufacturer had its own way of identifying vehicles, or performing transactions for infrastructure, then infrastructure providers simply will not make the investment required. The industry has to stick together and decide on a way to do things. The other challenge is regulatory. As things stand, there isn't a good framework for tokens and cryptocurrencies.

The other point worth mentioning is the unfamiliarity with the technology. What's happening here is a convergence of blockchain, IoT and AI, creating the ability for machines to pay as they go. These things are just beginning to dawn on the infrastructure operators, and whilst the ideas are fairly radical, the technology itself is not out of reach. We could do this today, if everybody agreed. Again, scale is needed, and there is a tipping point. There is a parallel with the development of the internet, in that the technology existed way before there was any agreement on protocol, or before it became useful in people's lives.

The industry move towards electrification is sending shock waves through the supply chain. As both light and heavy vehicles adopt hybrid and electric powertrains, the business potential dwindles for suppliers of internal combustion engines (ICE) and their associated parts.

“Companies that are too focussed on conventional powertrain technology have to redefine themselves one way or another,” cautions Pedro Pacheco, Senior Research Director (Germany), at Gartner. “Otherwise they will face serious difficulties in the future.”

Exactly how quickly electrified vehicles will penetrate the car market is up for debate. IHS expects hybrids to account for 25% of the light vehicle market, with 8% made up of electric vehicles (EVs), in just three years’ time. By 2030, Vision Mobility expects EVs to account for 30% of all new

vehicle sales around the world. While the rate of growth remains under debate, the direction does not, and automakers are preparing. Renault expects its EV offering to make up 10% of its sales by 2022. At Volkswagen Group, the aim is 20% by 2025. They will clearly need the supply chain on board to meet these targets.

“Sceptics could say that the industry won’t shift entirely to EVs in the next couple years, but nevertheless there is a transition under way,” emphasises Pacheco. “Suppliers that stick with a clear product focus around ICE will find it hard to grow profits, and their stock price will come under pressure.”

That means companies need to invest, either in their own R&D or in M&A. “In the year ahead, we predict continued disruption and change—one involving

BorgWarner’s Delphi acquisition becomes exemplar of EV disruption

BorgWarner's acquisition of Delphi reflects wider supply chain implications of the shift to electric vehicles. By Megan Lampinen



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Demand for EV components could skyrocket. Is the supply chain ready?

continued mergers, partnerships and joint ventures between start-ups, automakers and the supply chain—with the aim of making R&D more affordable, in order to truly reap the benefits of greener, connected and increasingly automated mobility,” says Geoff Davis, Chief Strategy Officer at Horiba MIRA and Member of the Automotive Council.








Spotlight on BorgWarner and Delphi

Powertrain specialist BorgWarner has seen the writing on the wall and has been taking a number of steps to diversify its portfolio to include more EV components and capabilities. The most significant development to date is the recently announced acquisition of Delphi Technologies. If the deal goes through as planned, BorgWarner will acquire Delphi Technologies in an all-stock transaction that puts the latter’s enterprise value at US\$3.3bn.

“First and foremost, this deal reinforces our leadership position in electrified propulsion systems,” Frédéric Lissalde, President and Chief Executive of BorgWarner, told analysts. “We will be better positioned than ever before to meet our customers’ evolving needs.” While the financial benefits are also compelling—BorgWarner anticipates an 11% operating margin for the combined companies—Lissalde made it clear that this is primarily a technology play: “From an M&A perspective, I have always said that technology would be the main driver, along with gaining scale in power electronics and system expertise. That’s exactly what we are doing today.”

ADDS SCALE AND CAPABILITIES ACROSS PROPULSION PORTFOLIO

BorgWarner

  <ul style="list-style-type: none"> ▪ Broad portfolio of combustion technologies ▪ Ability to leverage operational expertise across combustion portfolio 	  <ul style="list-style-type: none"> ▪ Broad portfolio of hybrid technologies ▪ Unique hybrid design and integration expertise 	  <ul style="list-style-type: none"> ▪ Broad portfolio of electric technologies ▪ Grid-to-wheel electrified propulsion system capabilities 	 <ul style="list-style-type: none"> ▪ Broad portfolio of combustion, hybrid, and electric technologies
<ul style="list-style-type: none"> ▪ Broad portfolio of complementary combustion technologies ▪ Addition of fuel injection and electronics complementary to BorgWarner's air management capabilities 	<ul style="list-style-type: none"> ▪ Recognized technology leader in power electronics with established products, production, customers, and supply base ▪ Ability to integrate power electronics directly into existing BorgWarner electrified systems or offer standalone products 		<ul style="list-style-type: none"> ▪ Commercial vehicle complementary technologies with competitive product portfolio
<ul style="list-style-type: none"> ▪ Significant Aftermarket revenue contribution across propulsion types and end markets 			

© BorgWarner Inc.

BorgWarner

Delphi Technologies has scale in the product areas where BorgWarner does not, and vice versa. While the latter boasts world renowned expertise in mechanical and hydraulic controls, Delphi brings more than 25 years of experience in power electronics and related systems software for EVs. And the market will clearly require more of what Delphi offers. By 2023, BorgWarner estimates the sales mix of the combined companies to break down as follows: 63% ICE, 29% hybrid and 8% electric. That 8% may seem relatively small, but it represents a very impressive 30% increase in BorgWarner's standalone exposure to the electric vehicle market. "Delphi is ahead of the curve on power electronics; it is world class. This deal positions us even better to capitalise on future powertrain migration," Lissalde reiterated.

Like most acquisitions, this one will entail some product overlap—

specifically in the area of valvetrain—but not much. For now, nobody is willing to talk about potential divestments, though nothing has been ruled out. Future leadership is also a little hazy. While Lissalde will remain in the captain's chair, nothing has been said about Delphi Technologies Chief Executive Richard Dauch. In response to questions about his future role, Dauch only stated: "My job right now is to run the day to day business at Delphi Technologies, to make sure we get shareholder approval and to work with Frédéric on a detailed plan for our two companies' future."

Industry reception

Industry watchers generally agree that this future looks promising. "There are definitely some attractive technologies that BorgWarner will acquire as part of this Delphi acquisition," notes Deutsche Bank Analyst

Emmanuel Rosner. The big focus for many is on electrification. For Kamalesh Mohanaragam, Programme Manager at Frost & Sullivan (F&S), "With the acquisition of Delphi Technologies, BorgWarner is on course to fast-track its bid for leadership of the electric drive market and emulate the top position it already enjoys in the All-Wheel Drive control systems market."

But there are plenty of other technological benefits as well, particularly around the aftermarket portfolio. "While the Delphi acquisition is being viewed from an OE perspective as a strategic move by BorgWarner to consolidate and bolster its alternate powertrain solutions portfolio, the deal is also important since it expands the company's aftermarket focus, diversifying it beyond its conventional offerings of engine and transmission related parts to more mechanical

STRENGTHENS SCALE AND EXPERTISE IN ELECTRIFICATION



Mechanical, clutching, and hydraulic controls expertise



eGearDrive® Transmission



Award-winning motors provide industry leading technology



Electric Drive Motor

Leadership in power electronics, software, and controls



High Voltage Inverter

=



Integrated Drive Module (iDM)

Well positioned to take advantage of future propulsion migration

Representative Example

© BorgWarner Inc.



components, including brakes systems and steering and suspension components,” believes F&S Global Research Manager, Anuj Monga. “Shifting powertrain dynamics in the automotive industry means that some of these newly added components to BorgWarner’s portfolio will continue to remain relevant in the aftermarket. This will help cushion the transition while both companies look for synergies in developing the new entity.”

Delphi should also help BorgWarner with access to a ready-made customer portfolio. “If you already supply a number of customers with EV components, you are in a better position than someone coming in from outside with new products and trying to sell to customers with which they are not currently doing business,” says Pacheco. “Delphi essentially gives BorgWarner a foot in the door.”

Consolidation and competition

That could prove invaluable as the powertrain segment enters a period of consolidation. Industry watchers are warning that players in this sector need to either gain new expertise or acquire a company that already has it. Some may choose to shift their focus towards a different area of automotive competence with greater potential. “Regardless, a clear definition of capabilities will be extremely important for suppliers,” believes Pacheco.

On the whole, the acquisition helps position BorgWarner with a sustainable advantage just before the competition really heats up. Some of this new pressure will come from players outside of the traditional automotive sector. “With ICE technology, you pretty much had to be an automotive company in order to have the capabilities to provide what was

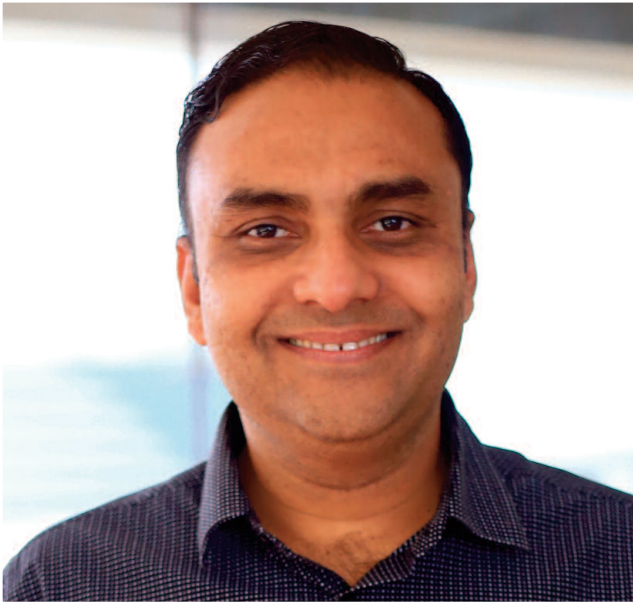
needed,” Pacheco points out. This is not the case with electric powertrains. The key components in this set-up are the motor, inverter and battery, all of which exist in other industries.

Theoretically, the move into automotive is not that big, and plenty of others are looking to do just that. Dyson tried, albeit unsuccessfully, to apply the electric motors and batteries it had developed for consumer applications to a car. Consumer electronics giant Sony just unveiled its Vision-S electric car concept at CES 2020, albeit with outsourced powertrain components. “It is likely that in the future we will see other companies try to get into the area of vehicle electrification,” predicts Pacheco. “This means long-standing automotive suppliers have to really shape up their capabilities in order to survive. Otherwise, they might find themselves in bleak situation.”



Continued electrification will allow India's micromobility scene to flourish

Micromobility start-up Yulu's Chief Executive, Amit Gupta, speaks to Jack Hunsley on how investment from Bajaj will change Yulu, and the future of micromobility in India



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The rising trend of scooter usage in India will continue and two-wheelers will be more attractive targets for electrification in the short term

Amit Gupta
Yulu

There are few major markets left in the world that remain untouched by micromobility. As more inner-city commuters look for alternatives to the personal vehicle, the rise of scooter and bike-sharing platforms has created huge interest and demand. In the US alone, for instance, McKinsey estimates that this market could be worth up to US\$30bn by 2030. But the potential profit aside, micromobility could also a hugely important role in reducing inner-city congestion and cutting transport emissions.

With these factors in mind, one key micromobility market is India. Already a popular scooter market, electrified micromobility platforms could help yield a new age of mobility. For example, according to TomTom, Mumbai and New Delhi rank, respectively, as the 1st and 4th most congested cities in the world. It is also estimated that the congested roads in Delhi and Mumbai, as well as Bengaluru and Kolkata, collectively cost India's economy US\$22bn annually. The opportunity to start solving this problem through micromobility has already attracted sizeable investment from players such as Uber and Ola, but one of the most recent announcements comes from Bajaj.

In November 2019, the two- and three-wheel scooter manufacturer announced it was to put US\$8m into micromobility start-up Yulu. Hailing from Bengaluru, Yulu has quickly developed a reputation in the Indian micromobility scene since launching in 2018. Offering both traditional bikes and electrified Vespa-style scooters, in May 2019 it announced a partnership with Uber. It is currently aiming to have 100,000 electric scooters on the road by December 2020—a rise of around 97,000 compared to December 2019.

To learn more about what doors Bajaj's investment will open for Yulu, as well as how India's micromobility scene will evolve this decade, *Automotive World* spoke to Yulu's Chief Executive, Amit Gupta, to learn more.

How important is the Bajaj Auto investment for Yulu?

For decades, Bajaj has been a leader in manufacturing shared public utility vehicles, and they have the best brains to run the business in the country. Further, they are the leaders in manufacturing two-wheelers domestically, with a sizeable market share in international markets too.

For a start-up like us with interest from international and domestic investors, it's imperative to create value and drive the ecosystem. Succeeding in the shared micromobility business is incumbent upon creating winning partnerships to ensure a supply of high-quality electric vehicles in large numbers. It was a win-win relationship for both of us, especially for Bajaj which will benefit by gaining expertise in the micromobility space. Yulu's electric two-wheelers will help Indian commuters with a first and last-mile connectivity option. This partnership aims to solve the mobility challenges of urban India in an eco-friendly manner.

How much will the tie-up change Yulu as a company?

This partnership will give Yulu muscle power to expand at scale. Being the sole designer and creator of a micromobility platform in India, we want to move Indians from point A to B in an eco-friendly way which cannot happen if we do not put enough electric vehicles (EVs) on road.

With this partnership, Yulu will leverage Bajaj's manufacturing expertise and continue to lead as the largest e-mobility start-up. As Bajaj is the leading global automaker player here, and has an in-depth understanding of the EV segment, Yulu will source electric two-wheelers from Bajaj which have been co-designed and manufactured exclusively for shared micro-mobility.

Secondly, there are and will be many learnings from this partnership at the product development level. Bajaj has a strong R&D team and Yulu will benefit from understanding the minute changes in



product development that can aid the customer experience. Our products are sharing-friendly and designed to be carbon neutral first. The new-age consumers are looking for trendy yet integrated services, and we will be able to achieve this by evolving our products.

What remains the key obstacle to widespread electric micro-mobility adoption in India?

Public transport in India is predominantly still driven by fossil fuels, and affordability can burden the common man. Consumer adoption of EVs has been limited due to practical factors like range anxiety and availability. Cities like Amsterdam have already embraced cycling to work as a way of life. India has similar examples right from chief executives to individual employees choosing an eco-friendly mode of transport to work, but the use cases are limited in number.

With our IoT-enabled EV fleet and machine learning-driven network intelligence, we are solving the demand-supply problem and growing our footprint in a sustainable manner.



“ Yulu CEO Amit Gupta says the company’s tie-up with Bajaj “aims to solve the mobility challenges of urban India in an eco-friendly manner”

How does that platform work?

Through our early partnerships with mass rapid transit systems like Metro, Yulu layers commuter patterns on top of its network intelligence, bringing high availability and convenience to our customers. This technology-driven approach is key to continuously increasing operational efficiency and helping to reduce traffic congestion in a meaningful way. Government assistance, complemented with better infrastructure, designated bike paths, public charging stations and so on will further accelerate the adoption of EV micromobility.

We have partnered with private IT parks today that offer companies space for setting up charging stations, or parking areas. We visualise micromobility from the lens of convenience, connectivity and charging. Yulu’s blueprint is focussed on being able to fill these gaps to drive shared electric mobility in India.

How much can we expect the urban micromobility scene in India to change across the course of the next decade?

And what will be the key developments and trends that will define the 2020s?

The micromobility segment is valued at US\$5bn. Globally, mobility is becoming shared, smart and sustainable. The millennials find shared mobility more economical and convenient and have a fondness for the renting economy, rather than buying an automobile. There is a dramatic shift in the demand for the automobile due to the rise of shared mobility, higher investments in public transport in cities, and leapfrogging to BS-VI. India is a country of bikers, and a majority of car owners also prefer to use a two-wheeler to get to work. The rising trend of scooter usage in India will continue and two-wheelers will be more attractive targets for electrification in the short term. Yulu offers a smart, sharable and affordable means of commute for the first and last mile.

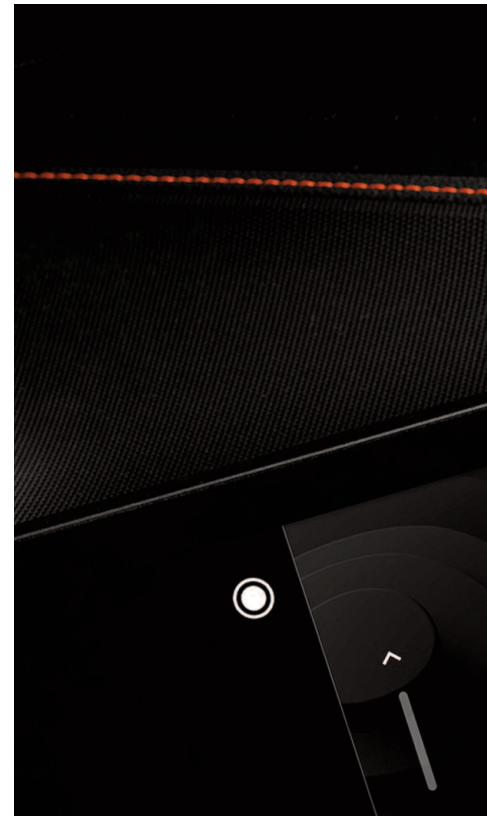
Our partnership with Bajaj and Uber is well poised to move forward for deeper engagement. This is a clear testimony of companies thinking ahead of time and understanding commuters’ challenges along with usage patterns. The next stage of growth will be driven by successful partnerships where companies bring services closer to commuters.

While automakers have struggled to build their own connectivity products, investing huge sums in immature and expensive technology, all Big Tech plans to do is scale up existing platform-based empires to encompass the car. In this way, Big Tech is carefully positioning its Trojan Horses to take control of the digital future of the automotive industry.

First came the ‘innocent’ infotainment domain, with allegedly risk-free partnerships between car manufacturers and tech companies—and it certainly made good sense for vehicle

screens to duplicate familiar smartphone content. Hence Android Auto, Apple CarPlay and (in China) Baidu CarLife. Today, most automakers simply sell technical interfaces for all common mirroring standards, rather than opting for an ‘either/or’ approach.

Now there’s an increasing number of AI-based voice assistants integrated into the car: Siri (Apple), Alexa (Amazon), and the like—and so the range of digital services around the connected vehicle is growing, and will continue to grow, until the advent of highly automated cars sees digital technology take hold right at the heart of vehicle design and manufacture.



Big Tech vs the automakers: The battle for the connected car

The tech industry has long seen the connected car as the next new ‘device’ for its services, writes Dr Jan Burgard, Founding Partner at Berylls Strategy Advisors



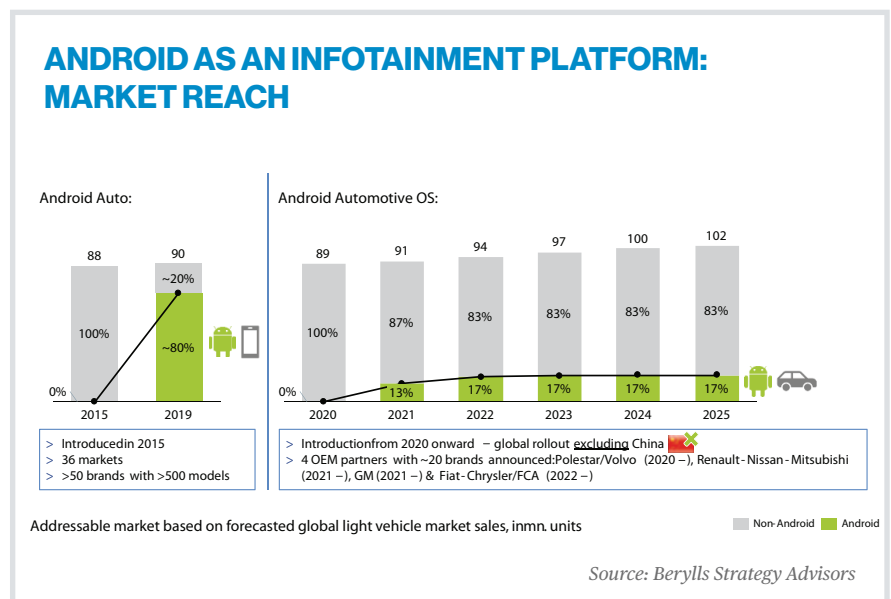
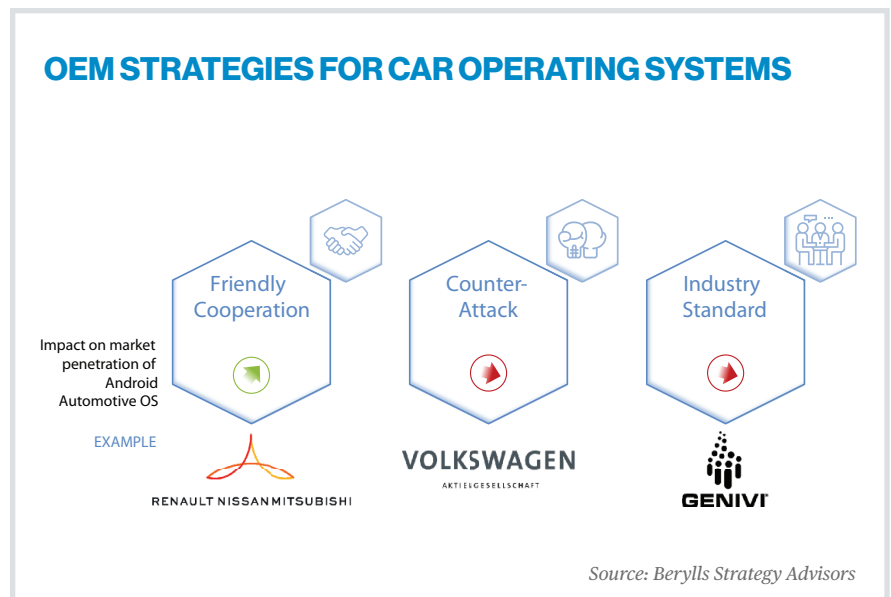
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Connectivity is a central enabler for the digital transformation of the automotive industry, but it's still unclear what the next connectivity wave will be—and who will own it

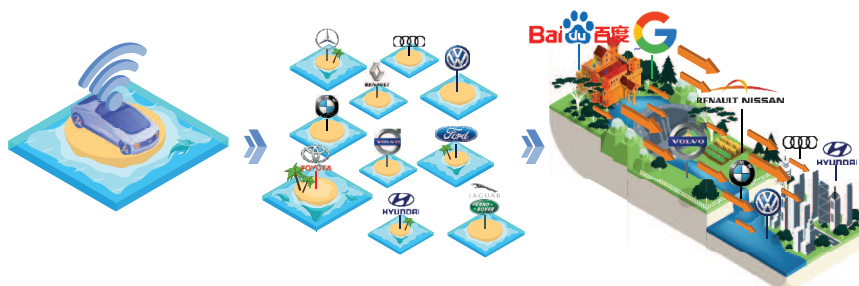
And that's when things get serious. Autonomous driving could see Big Tech seeking to dominate not only the provision of cloud-based services, and even the car's operating system, but right through to the hardware layer—the electrical and electronic components that are the automakers' home turf.

There's no way to avoid the unstoppable march of the connected car. Not only are all new vehicles in the European Union required, since March 2018, to have an emergency call (eCall) function as standard, but electric cars, car-sharing and autonomous driving are inconceivable without a fully connected vehicle. The new 5G wireless standard—a key prerequisite for highly automated driving—will bring another new wave of connected car technology.

No doubt about it, connectivity is a central enabler for the digital transformation of the automotive industry, but it's still unclear what the next

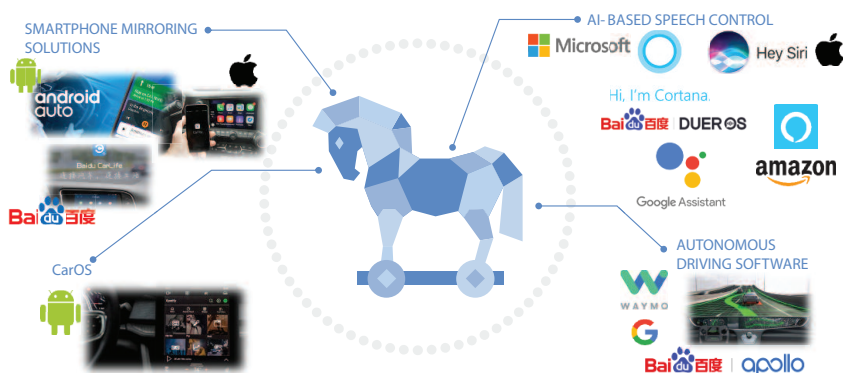


CONNECTIVITY: FROM SMALL ISLANDS TO BIG EMPIRES?



Source: Berylls Strategy Advisors

BIG TECH'S TROJAN HORSES



Source: Berylls Strategy Advisors

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 With a few rare exceptions,
 today’s vehicle-based
 connectivity services are
 lagging far behind
 smartphones in terms of
 performance and customer
 experience

connectivity wave will be—and who will own it. And it’s easy to underestimate how much is at stake here.

Attack of the tech industry
 Big Tech has something of a stranglehold over connected car technology—and for good reasons. Given the huge stakes, it might seem astonishing how readily automakers choose to co-operate with Big Tech companies, but the advantages are compelling, especially when compared with the challenge of developing independent operating systems that are a long way from the manufacturers’ core competencies. Hence recent Berylls analysis shows that, within a few years, Google has built up an impressive reach in the field of smartphone mirroring, extending to some 80% of annual global car sales.

Now Google is pushing ahead with Android Automotive OS, its new car operating system (CarOS) that’s integrated even more deeply into the car. It’s attractive and tempting to automakers, requiring minimal up-front investment and offering a comprehensive suite that can be adapted to automaker-specific needs, with the option of integrating additional services from Google. As Android is already a popular operating system, many drivers are familiar with the look, feel and basic functionality. Meanwhile, of course, the underlying software is state-of-the-art and continually developed and maintained by Google.

According to the analysis conducted by Berylls, pre-announced automaker partnerships will allow Google to achieve a noticeable global market reach of around 17% for its new product within only five years. While Google's advance into the CarOS market is unlikely to show similarly high growth rates for Android Automotive OS as seen for Android Auto—it is a fairly complex undertaking to implement and ramp-up a new CarOS from scratch—the forecast market shares might still be more than a wake-up call for

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If we can take one thing for granted, it's that the automotive industry has far from exhausted the potential for digital services

automakers and suppliers. Is it still possible for manufacturers keep control of the digital technology in their cars? How can they limit their increasing dependence on Big Tech, global technology companies which could, in time,

dictate the direction of vehicle development and future business models? And how can automakers build a direct line to the customer—in order to reap the benefit of any future profit pools that emerge from the connected car revolution? Despite all the obstacles, the race for CarOS supremacy remains open.

Should the automakers fight back? And how?

To date, automakers have adopted one of three main strategies:

The Cooperation Approach: In the volume segment of the market—GM, Renault-Nissan-Mitsubishi, for example—partnerships with Big Tech are popular, as they compensate for missing competencies, avoid larger investments and still offer attractive and up-to-date solutions. The downside is the increasing dependence on the tech industry.

The Counter-Attack: The premium manufacturers and groups, such as Volkswagen Group, have proved more willing to invest heavily in the development of their own software and independent operating systems, but it means taking on Big Tech at its own game.

The Industry Standard: A number of automakers and suppliers have joined the GENIVI Alliance, an automotive industry initiative

to develop a scalable, open-source solution based on Linux. As with the Counter-Attack, this scenario helps to keep the tech companies at bay.

In the battle to ensure that automakers retain control, and are able to differentiate their offerings in the face of specialist tech companies with high software competence, each of the current approaches has its pros and cons. But increasingly, a concrete starting point for 'self-assertion' is to offer multiple, value-added services via a targeted, personalised 'collaborate and compete' strategy.

With a few rare exceptions, today's vehicle-based connectivity services are lagging far behind smartphones in terms of performance and customer experience. On the move, the driver's desire to use such services as locating refuelling/charging, convenience/wellbeing (food and drink), or parking tend to involve a laborious, manual search in the navigation system, often with the aid of resorting to a smartphone.

Nor are the automakers satisfied. Today, no automaker operates a truly global, scalable connectivity platform. The reality is that automakers must maintain heterogeneous software versions of countless infotainment variants and generations.

An exciting, fully automated experience—where needs are recognised early on and personalised and operated via an engaging and innovative Human

Machine Interface (HMI)—would be transformative for the customer. And by adopting a standardised CarOS with flexible interfaces to connect to a range of content and service providers, the automaker can achieve this goal without reinventing the wheel.

Previously discrete, individual services, from real-time traffic data to music streaming to the mobile office suite, can be linked in real-time to form an intelligent and proactive solution chain. The automaker's partners can be mixed and matched, whether it's to provide Microsoft Office, Google Street View, Amazon Alexa, or more tailored, needs-oriented products. Whatever the package, the automaker owns the relationship and is perceived as offering customers the benefits of membership of a 'club' of digital services.

These value-added services differentiate the automaker's offering, establishing a sustainable digital business outside the reach of the tech industry. Tesla's well-known 'over-the-air updates' are just one dazzling example of the positive impact of high connectivity competencies on public brand perception, not to mention the targeted use of connectivity services as a loyalty tool.

Choose your battles wisely

At present, deriving a profit from automotive digital services is tricky. Most of the

connectivity programs launched in the last five to ten years show little or no profit. Indeed, the largest and oldest connectivity program in the world—GM's OnStar—recently launched a strategy sweep and has significantly shortened the trial periods for basic, safety-critical services such as eCall for new vehicles. To date, connected car business models are generally justified by cross-subsidising increased hardware sales of infotainment or navigation systems. Boosting monetisation is a hot topic.

However, via a consistent focus on a 'real' customer value, automakers can realise a significantly higher willingness to pay. Carefully positioned as an intermediary between the driver, the vehicle and third parties, automakers can tap into new sources of revenue. After all, the tech industry has long specialised in doing business as a middleman—as, indeed, have the automakers when it comes to electrical and electronic hardware.

And the current pools of potential profit? Automakers might want to focus their activities and investments on refuelling/loading, convenience/wellbeing, parking, functions on demand, service/after-sales, financial services, mobility... but of course stay alert and ready to respond to new value-added offerings as they emerge. Because if we can take one thing for granted, it's that the automotive industry has far from exhausted the potential for digital services.

COMMENT:

It's time to shelve Level 5 and target conditional autonomy

There was an admission in 2019 that full, unconditional self-driving won't happen any time soon. CES 2020 didn't exactly hammer that home, but there were signs. By Xavier Boucherat

It has the largest fleet, and it's been doing it for longer than most: few would argue that anyone but Waymo is the furthest ahead on self-driving development, with more than 20 million test miles on the clock, an active robotaxi service in Arizona, and the imminent launch of self-driving truck trials in Texas and New Mexico. The taxi service, which operates around the Phoenix area, has provided over 100,000 rides and has even begun rolling out 'rider only' trips—sans safety driver—for select customers.

It was therefore a telling, perhaps humbling moment for the industry when Chief Executive John Krafcik told attendees at a *Wall Street Journal* conference that autonomy will always have constraints. The technology will take decades to reach the roads in meaningful numbers, he said, and even then, certain weather conditions and situations on the road will still ground self-driving systems. In essence, SAE Level 5 autonomy—that's to say, full, unconditional autonomy—isn't going to happen.

It was the first of several admissions heard in 2019 which, collected together, amounted to an industry-wide climb-down on the autonomous agenda. In April, Ford Chief Executive Jim Hackett told the Detroit Economic Club that the blue oval had "overestimated" autonomy's arrival, and that the launch of a self-driving

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With the global vehicle market in downturn, and with Level 5 now surely a far-flung dream, perhaps now is the time to shelve the goal of unrestricted autonomy and concentrate on the quickest path to monetising the systems available today



In January 2020, GM's Cruise division unveiled its Origin self-driving shuttle

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This year, the emphasis at CES was on providing the vast computing power needed to enable autonomy. There was no mention of Level 5, but rather, a determination to press on with clearing the obstacles ahead

fleet in 2021 would be scaled back in scope and application. In the summer, GM's Cruise confirmed it was pushing commercial deployment past its original target of 2019, with Chief Executive Dan Ammann explaining that a big-tech 'move fast and break things' approach was unacceptable. Then there's Uber, notably quiet since 2018 for obvious reasons. "Self-driving cars are going to be in our lives," said Chief Scientist Raquel Urtasun, speaking at an April *Reuters* event in New York: "The question of when is not clear yet. To have it at scale is going to take a long time."

The message is clear: the bold predictions made between 2014 and 2018 will not come to pass, and the task of building robots that can navigate our roads as skilfully as humans is far harder than originally thought. Few, if any, are abandoning autonomy, but with many miles to go and billions in investment still required, there is a danger of fatigue setting in.

This is particularly risky for smaller companies. When driverless cars were just around the corner, start-ups had a much easier time attracting talent and investors. This could change, and enthusiasm could fizzle, potentially delaying the project further.

To prevent this, automakers must now turn their full attention to the devilishly tricky question of how to monetise self-driving, and soon. They must now consider the concept of conditional autonomy: a service that only ran in ideal weather conditions, for example, with geo-fencing and route restrictions, might be workable.

But was any of this reflected at CES 2020, an event which traditionally values radical visions and bold if not wholly realistic timelines? Visitors to Las Vegas this year found the usual assortment of self-driving demos, including one from Russian technology giant Yandex which took riders out onto public streets for driverless demos. In the past, automakers and tech giants have used the show as an opportunity to go large on a sleek, post-ownership future where commuters and more are served by fleets of robot cars, capable of fielding conference calls and streaming films and shows. At CES 2017, Nvidia Chief Executive Jensen Huang was promising Level 4 autonomy by 2020. Mobileye made similar promises the year before.

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When driverless cars were just around the corner, start-ups had a much easier time attracting talent and investors. This could change, and enthusiasm could fizzle, potentially delaying the project further


But even at CES 2019, the first such event after the fatal self-driving Uber crash in Tempe, Arizona, there was something of a slowdown. Suddenly, Huang was more excited about a Level 2+ system called Nvidia Drive Autopilot. This year, the emphasis was on providing the vast computing power needed to enable autonomy. There was no mention of Level 5, but rather, a determination to press on with clearing the obstacles ahead.

Meanwhile, in a reversal of attitudes, rival chipmaker Qualcomm chose this year to unveil Snapdragon Ride, an autonomous driving platform. In previous years, it had been consistently sceptical of making money from self-driving, and had even gently ridiculed competitors. But here too, there were signs of restraint: Cristiano Amon, President, spoke of a focus on Level 2 Plus, but said the system could scale up to 'Level 4 Plus'. Whatever that means, it's still just short of the Holy Grail.

Of course, nothing will stop the automakers bringing futuristic concepts along to CES, but even here there was arguably some toning down. BMW's i Interaction Ease concept, for example, showed us a world where self-driving was common, but the focus lay far more heavily on how interiors will change, and how HMI will become more intuitive with intelligence in the cockpit and interactive surfaces. Daimler, too, minimised the emphasis on autonomy for its otherworldly Avatar concept, stressing sustainability with its 'Vision Zero Impact' concept. It even had a manual driving option, despite lacking a steering wheel.

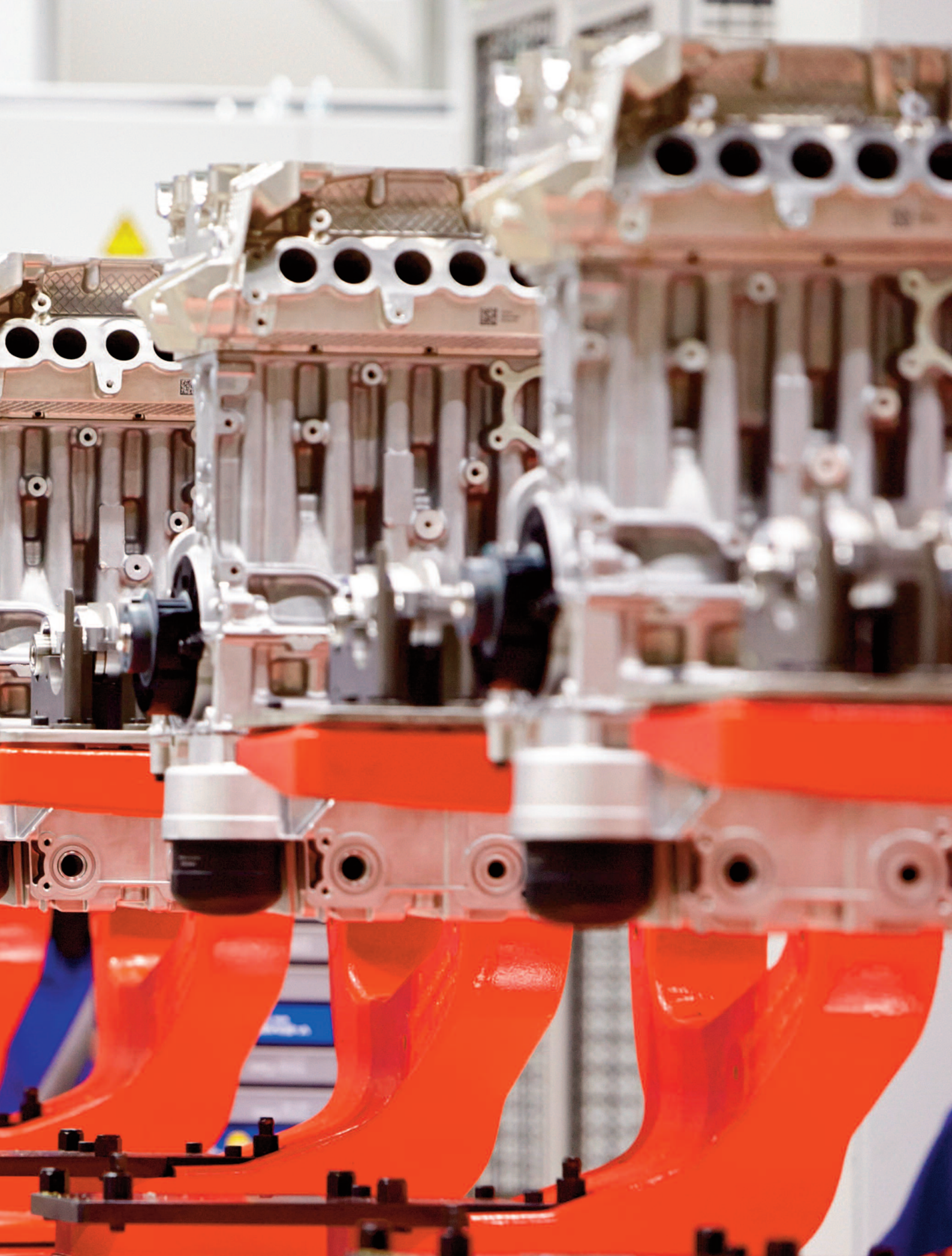
CES may not be the time or place for discussing the here and now. But with the global vehicle market in downturn, and with Level 5 now surely a far-flung dream, perhaps now is the time for everyone to shelve the goal of unrestricted autonomy and concentrate on the quickest path to monetising the systems available today, or which might shortly be realised. In some sense, this is what Waymo, along with Chinese competitor WeRide, is already doing with its trials.

Developers must be cautious, so as to not repeat Uber's mistakes, and if that means no self-driving vehicles on a rainy day, then so be it. Just how possible this is remains to be seen: restrictions will limit scale, damaging the ability to handle the large costs associated with autonomy. But it seems like a safer bet than pouring more money into a concept that might never materialise.



How will the death of the ICE impact suppliers?

The end of the combustion engine may be decades away, but with such a large industry at stake what can be done to secure suppliers' futures? By Freddie Holmes



The automotive industry is entering one of the most significant periods of change in its history, as it slowly transitions away from diesel and gasoline internal combustion engines (ICE). It is not only automakers at threat, but also the diverse network of global suppliers that support them.

There is growing concern that businesses which specialise in ICE components and systems could see orders cut or cancelled entirely in future, with those contracts instead going to specialists in electrified powertrains. Such concerns would not have been soothed by suggestions that, with fewer components, battery electric powertrains could put workers out of a job. In December, *Bloomberg* found that automakers may need to cut around 80,000 jobs as EV production ramps up.

Waning demand for diesel cars has already impacted some plants involved in the production of diesel engines, with Bosch, ZF and Continental all warning of job cuts recently. “It will have an impact on employees, especially in the diesel plants,” Bosch Chief Executive Volkmar Denner told German newspaper *Süddeutsche Zeitung* in August. According to the National Platform for the Future of Mobility (NPM), the transition toward e-mobility will not only affect the number of jobs available, but also the nature of that work. The trend is having “a larger and larger impact on employment

structures,” said Jörg Hofmann, Head of NPM’s Working Group 4 and Chair of the German Industrial Union of Metalworkers.

alternatives for which demand currently pales in comparison. “Electrification requires high investments from all market players,” said a spokesperson

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Where it makes sense in terms of fuel efficiency, clean air and market volumes, further development of ICE technology will continue—but other parts of the business will be managed to shrink

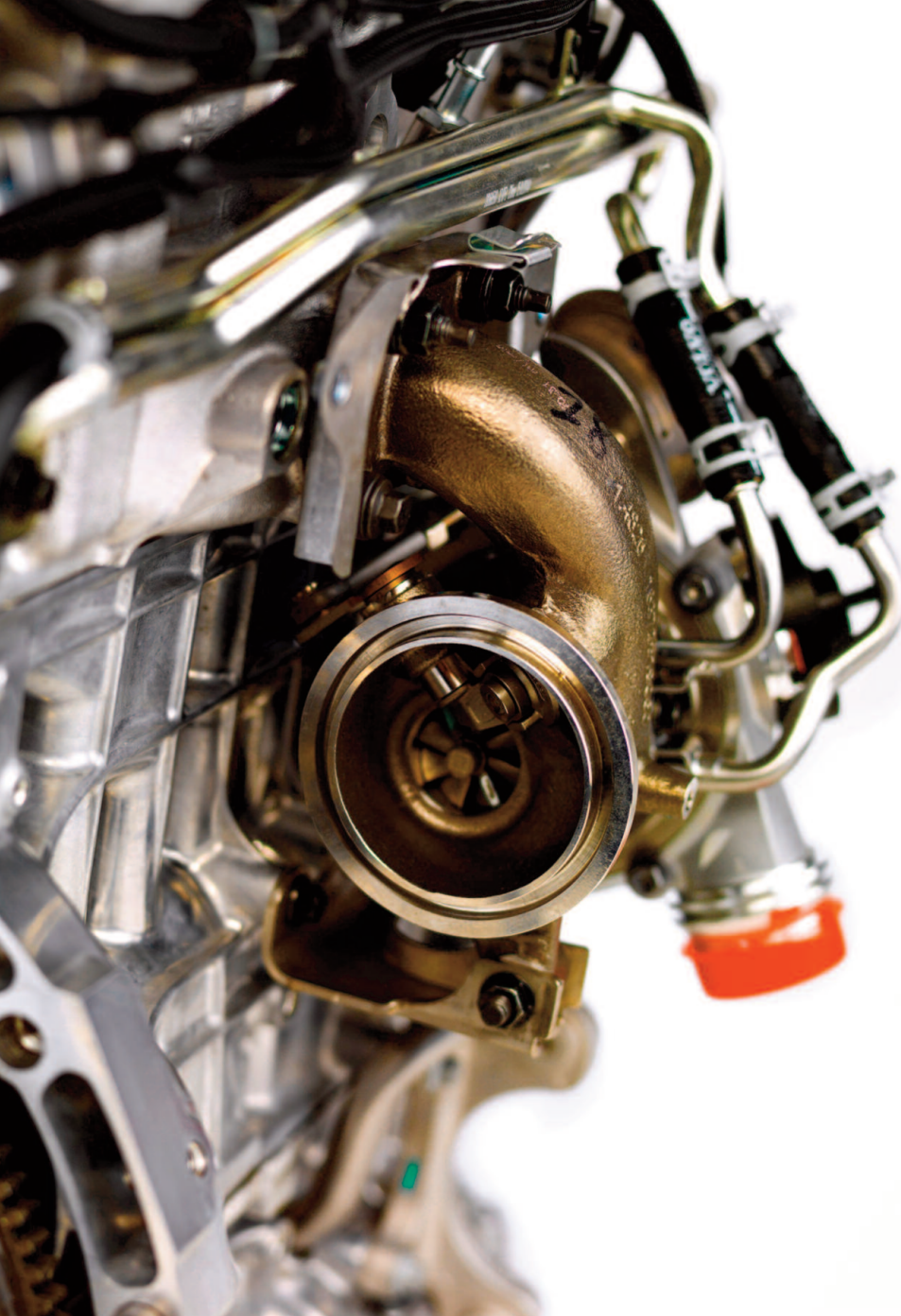
It begs the question: how will the death of the ICE impact today’s suppliers?

Finding the right balance

This is a question that most of the major Tier 1s have already addressed, and have gradually reshaped their portfolios over the last decade at least. Nevertheless, the long-term challenge should not be understated; today’s suppliers must continue developing a technology that will eventually be phased out, whilst also investing in expensive

from Continental. “At the same time, regulations require advanced combustion engines with high efficiency and low emissions which meet real-drive-emission regulations. The challenge for all companies is to find the right balance.”

Sigrid de Vries, Secretary General of the European Association of Automotive Suppliers (CLEPA), suggested that the automotive industry is “undergoing the biggest transformation in over 100 years,” with e-mobility “both an opportunity and a challenge for ICE suppliers, with competition getting tougher overall.”

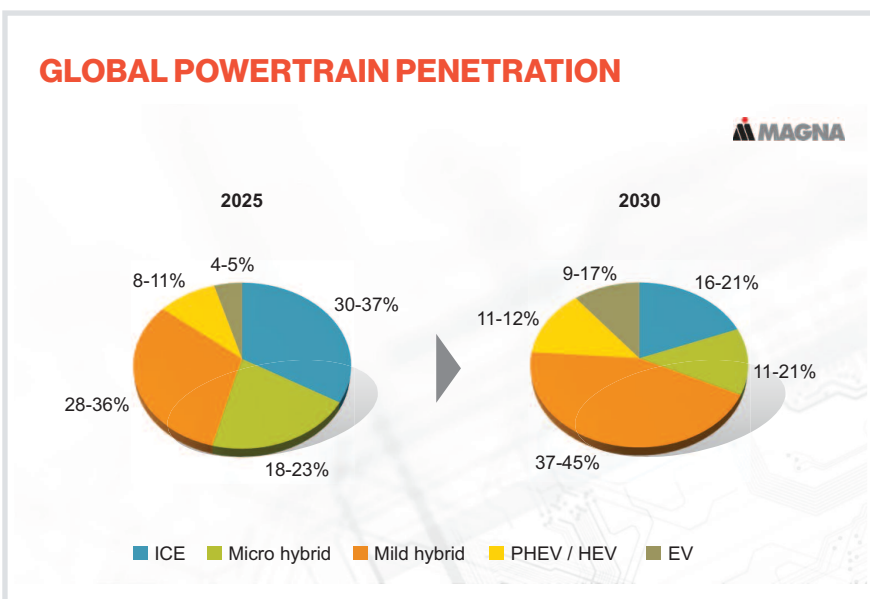


With fewer components, could battery electric powertrains put some workers out of a job?

Despite the challenge, hybrid powertrains look set as the next big thing in the long run.

Tier 1 supplier Magna, which [is heavily invested in the electrified powertrain](#), currently predicts that pure ICEs will account for just 16-21% of all powertrains by 2030. By comparison, mild hybrids are expected to take a 37-45% share of the market, with PHEVs and HEVs accounting for 11-12%. By the end of the decade, it predicts EVs will hold a 9-17% share of passenger car powertrains.

Clearly, this will influence how both technology and manufacturing investments are directed. New hybrid architecture, thermal management and power electronics will become key elements to the portfolio, and plants will need to be outfitted with the necessary tooling, robotics and workforce. “Manufacturers and suppliers are undertaking enormous efforts to bring advanced alternative drivetrain solutions to market,” said de Vries. “In this context, it is expected that business revolving around combustion engines will decline, and this impacts investment decisions too.”



Some have vowed to go 'all electric' by fully embracing the range of hybrid solutions available



Importantly, all of those hybrid powertrains still rely on an ICE; suppliers will not sit on their hands and let such a pivotal technology become outdated. “While electromobility is gaining traction, ZF estimates that at least 70% of all new passenger cars in 2030 will still have an internal combustion engine,” said Stephan von Schuckmann, Head of ZF’s Car Powertrain Technology Division.

“Where it makes sense in terms of fuel efficiency, clean air and market volumes, further development of ICE technology will continue—but other parts of the business will be managed to shrink,” de Vries explained.

Sought-after specialists

But does powertrain electrification pose a threat to certain areas of the existing supply chain, or is it an opportunity for all involved to find new growth? Daniel Pokorny, Head of Corporate Communications, Future Trends at Schaeffler, pointed out that suppliers now play a greater role in the production of a new vehicle than ever.

“Automakers are increasingly expecting their suppliers to perform as system suppliers and are demanding complete systems of an ever-greater scope and complexity,” he told *Automotive World*. “For suppliers with strong drivetrain expertise—suppliers like Schaeffler, which in recent years has made the transition from component to system supplier—this is an opportunity to offer a broader range of products and services.”

Suppliers that have a broad and deep understanding of the complete drivetrain are in “high demand,” he added. “Where once the demand was for clutches, torsion dampers and bearings for transmission systems, now it’s for entire transmission units or drivetrains in all-electric vehicles.”

As things stand, European suppliers are “well prepared” to handle increased demand for

hybrid-electric powertrains, said de Vries. “The strong systems know-how in drivetrains makes them well positioned to deliver innovative solutions for e-mobility, as illustrated by uptake by major OEMs in this field,” she explained. “Europeans are capitalising on essential competence in tooling, production, process insights—all needed to produce high-quality vehicles for mass-market use.”

Highly advanced ICEs

Electrification may steal the headlines, but hybrid powertrains capture a negligible portion of the new car market today. The switch to zero emissions will not happen overnight and that means continued refinements to the ICE must continue where possible.

“By 2030, the ICE will still play a major role in the mobility sector because the majority of cars will be hybrids in all lead markets such as the EU, China and the US,” noted Continental’s spokesperson. The supplier envisions a highly advanced ICE by this point, which will draw on numerous means of reducing fuel consumption and emissions: direct injection, turbocharging, lean combustion and an increasing number of sensors, for example.

Particular emphasis will be placed on improving ‘cold starts’, where aftertreatment systems need to reach their optimum operating temperature to keep emissions low. With the engine in a hybrid vehicle frequently engaged and disengaged during a journey—perhaps even after a drive of 30 miles or more in full electric mode—it is important to optimise those ‘engine off’ phases. “Adapted combustion methods will be implemented,” said the Continental spokesperson. “The availability of recuperated electric energy allows for smart solutions like the electrically heated catalyst.”

ZF’s von Schuckmann noted that automakers are primarily concerned with being able to flexibly adapt hybrid versions to the “shifting sands” of changing market requirements. “To comply with stringent CO2 thresholds in the future, a substantial number of these vehicles will likely have an electric motor alongside the internal combustion engine,” he told *Automotive World*. “By the end of the next decade, the hybrid drive is predicted to be a fixture in modern cityscapes,

either as a modest electrically driven model with 48 volts or as a high-volt model with electric ranges of up to 100km.”

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The combustion engine is not old tech and it has an important contribution to make for the transition, globally

Too big, too small, or just right?

Over the last couple of decades, automakers have also taken steps to reduce the size of their engines—even for models that are geared toward performance and driving experience. The industry is at a point where even 1.0-litre engines can be found in SUVs. Can the trend continue—and if not, what is next?

By 2030, Continental expects that combustion engines will remain downsized, with losses in power and dynamics ‘compensated’ by the high torque of electric motors.

[Others in the industry suggest engine size may increase slightly](#) in relation to the size of the vehicle in question. “Both downsizing and ‘rightsizing’ will continue in response to the ever stricter CO2 targets, as well as the ever-increasing performance that innovation and new technologies offer,” said CLEPA’s de Vries. “Downsizing can be seen as a

‘flexible rightsizing’, which means a smaller engine but with the same power and torque—in case it is required—without carrying

around a large engine unnecessarily.”

Echoing other views held by industry stakeholders, CLEPA is also advocating for synthetic fuels, which “deserve a place in the decarbonisation mix”—along with hydrogen fuel cell powertrains. “Mobility and transportation needs are highly diverse and this is not likely to change any time soon. The combustion engine is not old tech and it has an important contribution to make for the transition, globally,” de Vries concluded. “The BEV is a great solution, but not the only one.”

Automotive suppliers are businesses first and foremost, and must support the needs of their automaker customers as they evolve. How rapidly the ICE evolution will become apparent over the coming years, but suppliers reliant on diesel and gasoline alone must consider diversifying sooner rather than later.



Benefits of blockchain start to add up for automakers

Why would a vehicle manufacturer want to investigate cryptocurrency? By Freddie Holmes

As part of the CASE transformation, automakers are evaluating all manner of unconventional technologies. Blockchain is certainly one of the less familiar areas, but as the vehicle becomes a means of transferring data and making payments, it all starts to make sense.

The concept of blockchain first hit the mainstream following the launch of Bitcoin in 2009, a cryptocurrency that, at the time, was pegged as the next generation of banking. While Bitcoin is yet to hit the lofty heights that were once expected, the underlying platforms that support such cryptocurrencies could prove extremely useful in a number of automotive applications.

Smart wallets

One automaker that has shown an interest in cryptocurrency-based services is Jaguar Land Rover (JLR). In April 2019, it partnered with the IOTA Foundation, an open-source cryptocurrency, to investigate how cars could make payments with connected devices and infrastructure while in transit.

Through the project, a number of Jaguar F-PACE and Range Rover Velar SUVs were equipped with 'Smart Wallet' technology. Rather than leveraging blockchain—which is based on 'blocks' of data connected via a chain—the IOTA framework is based on a 'tangle' of data. It is designed to facilitate the rapid

and frequent 'micro transactions' that may occur between interconnected electronic devices in future.

Just like blockchain, IOTA is decentralised. This means it is independent from any financial or government authorities. As things stand, it is the only cryptocurrency based on tangle. On face value, its distributed ledger technology (DLT) shares close similarities with blockchain and represents another 'crypto' alternative to conventional data transfer. For JLR, a key focus is to find tangible use cases for the technology at a consumer level.

One proposal would leverage IOTA to reward drivers for sharing vehicle and road data

with third parties. Those cryptocurrency-based rewards could be redeemed for services such as paying for tolls, parking or electric vehicle recharging. "At Jaguar Land Rover, we are testing innovative connected car services enabling drivers to earn cryptocurrency and make payments on the move," explained Lars Klawitter, Managing Director of Studio 107, JLR's mobility services arm that sits alongside the automaker's venture capital business, InMotion Ventures.

While JLR has been working with IOTA, the manufacturer is also open to other cryptocurrency platforms, including blockchain. "A significant field of interest is the future of mobility, where we



Digital identities are a particular focus of research done by industry consortia and research groups. For the mobility industry vehicle identities would be the focus of interest

Blockchain could enable cars to pay for tolls, parking and more—and all while on the move



TOLL BOOTH DETECTED

can envisage an ecosystem of vehicles with smart wallets that allow them to utilise and pay for services like road tolls automatically, or receive rewards,” Klawitter explained.

Independent yet secure

But what benefits does blockchain in particular hold over traditional payment

methods that relate to running or using a vehicle? Jaguar has already introduced an in-car payment system that allows certain models to pay for fuel wirelessly via an app, for example. Through



cryptocurrency, those and other payments could be made more securely, explained Klawitter. “Tamper proof data and decentralisation are inherent properties of public blockchains,” he said. “These

make the technology interesting for OEMs in many ways, including supply chain tracking and service history.”

Through ‘cryptography’, it is impossible to change or

counterfeit any of the records included in the block, or a tangle in IOTA’s case. A single block could include data such as the type of service being paid for, the time of the transaction and the amount of money transferred. Because of the unique collection of data being stored, each block has its own individual code—or ‘hash’—from which it can be identified. Each block also carries the hash included in the previous block within the chain. If the data in one block is somehow tampered with, that hash instantly changes across the chain and renders it invalid. Importantly, data can only be appended as opposed to deleted, and the upshot is that blockchain transactions are considered to be extremely secure.

“Blockchain can be used as a payment platform and is the basis for the famed Bitcoin and many rival crypto-currencies,” noted Matt Hervey, Head of Artificial Intelligence at Gowling WLG. “But it’s much more than that—blockchain enables the storage and sharing of any kind of information between very large numbers of users in such a way that it is practically impossible for a small number of users to fraudulently alter the records.”

“Being ‘tamper proof’ is a property of all public blockchains, meaning that nobody, not even the creator of data, can change the data after it has been submitted to the blockchain—and confirmed by the respective consensus mechanism,” added Klawitter. “A decentralised digital currency

only works if there is no way of retroactively changing transactions.”

Blockchain could also be used to create tamper proof profiles that can identify connected Internet of Things (IoT) devices such as cars and infrastructure. “This would make a powerful backbone for new business

investigate as connected vehicles begin to form part of a wider connected ecosystem.

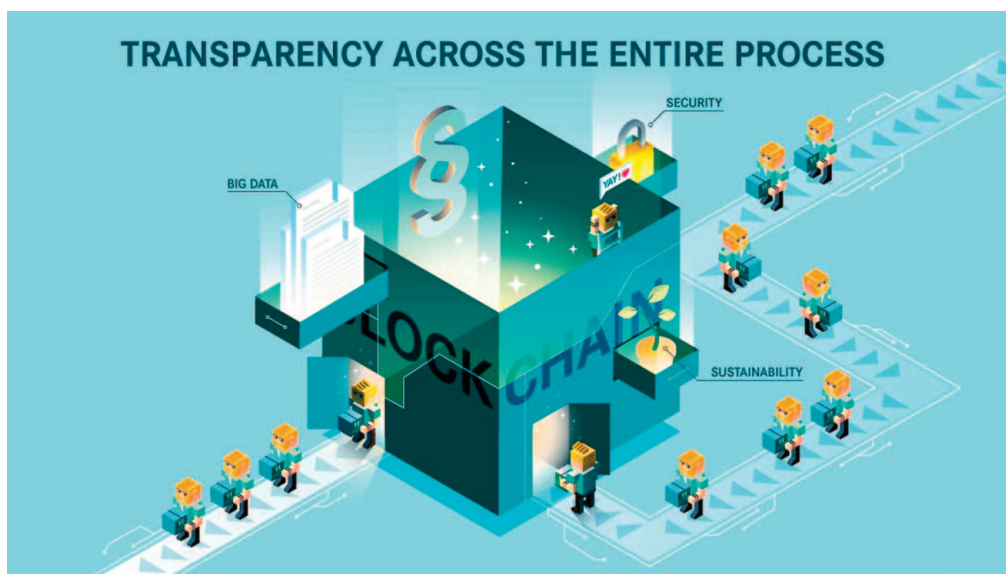
Collective interest

JLR is not the only automaker to consider what blockchain might mean for their business and customers in coming years.

vehicle recharging. Further into the future, Porsche expects blockchain to be used for services and functions relevant to autonomous vehicles, such as sharing data with other surrounding vehicles.

Daimler has made a similar push to understand what blockchain might mean for the industry,

Blockchain transactions are considered to be extremely secure



models and circular economies for asset sharing and service usage,” suggested Klawitter. “In recent years there has been quite a bit of research on how these properties of the blockchain can also be used to create other types of data in an immutable way. Digital identities are a particular focus of research done by industry consortia and research groups. For the mobility industry vehicle identities would be the focus of interest.”

As things stand, ‘trusted vehicle identities’ remain in the concept stage, but JLR will continue to

Early in 2018, Porsche announced that, through a partnership with Berlin-based start-up XAIN, it was the first automaker to ‘implement and successfully test’ blockchain in a car. XAIN had previously won the Porsche Innovation Contest in 2017. A range of data transactions were trialled, some of which included locking and unlocking the vehicle through a smartphone app and providing temporary access authorisations—useful for when packages need to be delivered to a vehicle, for example. The technology could also be used to pay for parking fees and electric

even establishing a ‘Blockchain Factory’ that operates within its Daimler Mobility business unit. Harry Behrens, who leads the Blockchain Factory, recalls that back in 2016 it became “increasingly clear” that there were many areas in the company where blockchain technologies would be “very appropriate.” Like JLR and Porsche, primary use cases revolve around payment systems, verification, data security and tokenisation.

“There is a trend towards urbanisation and a decrease in private mobility in cities. All of this is leading us towards multi-

modal mobility by which customers and citizens move through cities using various modes of transportation like scooter, bike, e-bike, ride-hailing, car-sharing, public transport etc,” Behrens told *Automotive World*. “The future of mobility should accommodate this with a maximum of

(peer-to-peer) by design is the perfect fit for such an environment. It provides seamless and deep integration with minimum invasiveness and integration effort.”

Then there are the potential benefits for the trucking industry to consider. Volvo Truck suggests

offering,” Dan Selman, Chief Technical Officer at Clause, explained during a Berlin conference in 2018. “Everything needs to be verified in real-time.” Blockchain could help to identify, verify and securely transmit that data and cryptocurrency between the various parties involved. That is, assuming that platooning does take off.

Testing the water

It is unclear whether blockchain-based services will take off any time in the near future. At a consumer level, the appeal of using anything other than a centralised currency is likely to be fairly low at this point. Cryptocurrency’s usefulness is relatively limited today; while a select number of online retailers do accept cryptocurrency, it is far from being a widely accepted payment method. More so than anything else, Bitcoin is used to buy and trade other types of cryptocurrencies, for example.

If the cryptocurrency was stored in the vehicle’s digital wallet, it could help to make daily payments easier, be it recharging an EV, zipping through a toll bridge or pulling into a parking spot. How that dynamic plays out with the anticipated rise in shared vehicles remains to be seen—would the e-wallet form part of a user profile stored in the cloud?

For now, automakers will continue to evaluate the benefits and consider whether blockchain is worth the hype.



At Jaguar Land Rover, we are testing innovative connected car services enabling drivers to earn cryptocurrency and make payments on the move

*Lars Klawitter,
Studio 107*

flexibility and comfort to the customer and with a minimum of overhead and cost to service providers. Blockchain and digital identity (DID) provide key mechanisms to realise the software infrastructure for such scenarios.

“Urban mobility will be decentralised in the sense that there are multiple modes of transportation, each potentially served by several, competing service providers,” he continued. “Blockchain being decentralised

that blockchain could be used to create ‘smart contracts’ on the fly, which would help to reduce administrative effort and errors. For example, trucks involved in a platoon will need to have individual contracts that ensure the benefits are split fairly—with the lead truck perhaps charging an ‘access’ fee to trucks looking to join the platoon. “It requires trust between all participants, not that the technology will work, but that everyone is playing by the rules and has created the best service

The in-vehicle experience will include more than just the car, says Daimler

With consumer expectations evolving, keeping pace with demand will rest of leveraging and understand data. By Jack Hunsley



As populations increase and cities continue to grow, many people today are spending more and more time in their cars. In the US, for instance, a study conducted by the AAA Foundation for Traffic Safety in 2019 found that, collectively, Americans spend 70 billion hours behind the wheel per year—an 8% increase compared to 2014—with the average commuter on the road for around an hour a day. Per person, it may sound like a short period of time, but ensuring this hour is as enjoyable as possible is a crucial factor that automakers are keenly focused on getting right.

How exactly automakers can succeed here is up for debate, especially as consumer demands

and technology rapidly develop. However, as Daimler's Vice President of Digital Vehicle & Mobility, Georges Massing, explained to *Automotive World*, one possible route could be mapped by focusing on the growing influence of digitalisation in other sectors.

More than just cars

“Digitalisation not only in the automotive industry but also of modern life in general has a big influence on customer interaction,” said Massing. “Driven by the fast development of smartphones and other personal devices, the functional expectations of our customers has risen tremendously. Operation via direct touch displays has become more



widespread compared to remote operation, and fewer switches can be found in our cockpits.”

He noted that improvements in voice recognition technology have also allowed the automaker to remain bullish about introducing new in-vehicle capabilities. In December 2019, Daimler announced that it was continuing its partnership with voice tech guru Cerence. Together, the pair are working to improve the Mercedes-Benz User Experience (MBUX) multimedia system by developing AI-powered learning capabilities.

“The importance of voice control has also been a major change,” added Massing. “Here we’re especially proud of our ‘Hey Mercedes’ voice control, which also shows that we’re constantly working on bringing new and upcoming technologies into our vehicles.”

Another important vertical has been the integration of mobile applications that allow Daimler and Mercedes customers to



interact with their vehicles via their smartphones. The Mercedes-me app allows vehicle

owners, among other functionalities, to check fuel levels, lock their vehicles

through their phone—the app will also notify customers if they have forgotten to lock their vehicle in the first place—summon their vehicle with remote parking capabilities and also locate a lost vehicle if the owner is within a one-mile radius of their car.

“Our focus is not only on the customer interaction inside the

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Driven by the fast development of smartphones and other personal devices, the functional expectations of our customers has risen tremendously



car but also the increasing importance of the connection of personal devices and vehicles,” said Massing. “The Mercedes-me app will enable us to continuously offer new functions for this form of interaction as well.”

New arrivals

Another factor firmly on Daimler’s radar is the arrival of new players into this space. As vehicle interiors and dashboards become increasingly connected, a whole new ream of players including Spotify, Netflix, Amazon, Google and Apple are

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These tech players have definitely broadened our competition, but they have also enriched it

ving for consumer attention. But, while on paper the emergence of these well-funded players could be a cause for concern, Daimler sees opportunities.

“These tech players have definitely broadened our competition, but they have also enriched it,” said Massing. “Customers quickly get used to new technological solutions



provided for their smartphones and are now expecting the same experience in our vehicles. This creates possibilities for collaborations and the integration of popular systems.”

Collaboration with Amazon and Google can be dated as back to 2017 when the automaker announced compatibility with Google Home and Amazon Alexa. Android Auto and Apple’s CarPlay can also be used by Mercedes-Benz customers. However, while Daimler is open to integrating these third party platforms, it remains convinced that it will need to supplement these offerings with its own creations.

“An in-vehicle multimedia system needs to meet several requirements,” added Massing. “However, we strongly believe that simply taking over their solutions will not be enough to provide the best in-vehicle

customer-experience, which has been a key factor in the continued development of our MBUX.”

New concepts, new cockpits

With the pace of development increasing, some focus at Daimler is also already being dedicated to a world beyond single-occupancy internal combustion engine (ICE) vehicles. As shared mobility offerings become a more affordable and common alternative to private vehicles, exactly how consumers will interact and behave within a vehicle that is not their own is a key question. Here, Massing noted that catering for many different passengers in one vehicle is just one option in this space that Daimler is exploring further.

A transition towards electric mobility also presents new in-vehicle challenges. As readouts concerning fuel consumption are swapped for battery range, redesigning the dashboard around electrified mobility is a key challenge. “For our electric vehicles (EVs), we will, of course, offer new features in our UI, specifically addressing the needs of the car and customer,” said Massing. “That includes, for example, optimised route planning or driving recommendations.”

Autonomous vehicles (AVs) will also require a concept redesign. As Massing detailed, how AV passengers spend newly found time on journeys could unlock significant new revenue potential. “Autonomous driving creates not only a new playground for us developers, but also completely new opportunities for customers to make use of their travel time,”



he said. “To enable our customers to make use of this new degree of freedom gained through autonomous driving, Mercedes-Benz will set the optimal environment by redesigning the interior. The focus of the in-vehicle experience will move from a

intelligence, comfort and health features, gaming and digital assistants will have a major impact on the changes in the in-car experience.”

These new possibilities, Massing stressed, will only be made possible through leveraging data;

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Our focus is not only on the customer interaction inside the car but also the increasing importance of the connection of personal devices and vehicles

driver-centric approach to an all passenger approach and the car will turn into the ‘third living-space’. Besides the CASE topics, 5G, connected services, artificial

firstly, for its help in identifying new focus areas, then also in creating and enabling new functionalities. “Analysing and using this data creates new

opportunities for connected services, customer convenience and individualisation,” he said. “But of course, it also comes with great responsibility. Data security and privacy rights have always been and will, of course, remain the focus of our business.”

Still a Mercedes

Change may be afoot, but it is unsurprising that at the core of Daimler’s development is a desire to retain a bespoke brand experience. Exactly what a vehicle’s interior will look like and how people will interact with future vehicles may change, but when a passenger steps into a Mercedes-Benz, the company believes it must be still instantly recognisable as a Mercedes-Benz.

“The well-known Mercedes-Benz user experience will not change dramatically,” said Massing. “Our focus will be on user-centred functions and UI development, to be able to serve future customer needs in the best possible way. Not only will the variety of functions change, but how consumers operate these systems will develop over time to become more multimodal, natural and intuitive. The overall customer

experience will no longer be limited to the car, but there will be a smooth transition from the vehicle to the rest of the customer ecosystem and vice versa.”

Renault futureproofs EV delivery with hydrogen range extender

Megan Lampinen takes a closer look at the hydrogen range extender used in Renault's electric LCVs

A handful of automakers have been exploring the mix of hydrogen and battery technology in heavy trucking, but not so much noise has been made in urban delivery applications—until now. Europe's electric vehicle (EV) pioneer is drawing on the help of small hydrogen range extenders in the light commercial vehicle (LCV) market. According to Renault, it's the perfect technology match for this segment and can offer up to three times more range than a battery electric set-up alone.

The range challenge

Today, Renault offers four electric LCVs and claims a leadership position in Europe's electric LCV segment with a 41.5% market share. By 2022, it

intends to electrify its entire van range. The models so far have proven particularly successful with delivery companies that operate a return to base model, allowing for overnight charging at the depot. However, there's plenty of room for improvement.

Take the Renault Master Z.E. as an example. Its battery provides 120km (75 miles) of range, but a driver will almost never use that full capacity. Range anxiety means that most operators will not get beyond a portion of that. If a driver never travels more than 80km before charging, he loses out on much of the battery's potential.

Hydrogen can solve that. The addition of a small hydrogen range extender, courtesy of Michelin subsidiary Symbio, boosts the Master Z.E.'s range from 120km to 350km. For the Kangoo, it means a smaller but

still notable jump in range from 230km to 350km.

Importantly, the reassurance of the hydrogen means that drivers will be able to maximise the battery's full range, with no need to return to base early due to fears of becoming stranded. "The LCV segment, which tends to consist of fleets operating predictable and repetitive routes, is the most relevant for this technology," asserts Renault's Philippe Divine, Director of the LCV business.

Renault's first offering with this propulsion set-up debuted last year in the form of the Kangoo Z.E. Hydrogen; the Master Z.E. Hydrogen will follow later in 2020. One of the first Master Z.E. models was on display at CES 2020, where *Automotive World* had a chance to test the driving capabilities and explore the design first hand.



“People know that the full EV version works. This approach just addresses the range concerns that some have” - Philippe Divine, Director of Renault's LCV business

Renault is offering hydrogen range extenders on the Kangoo ZE and Master ZE LCVs



An inside view

The vehicle drives exactly as an EV would, with silent operation, though synthetic sound will be provided to address concerns around safety for vulnerable road users and pedestrians. Two hydrogen tanks, which can take 56 litres each, are located under the body. While they add 200kg of weight, they pose no compromise to load volume. This is particularly important for commercial delivery applications, where volume restrictions could prove damaging to the business case. The hydrogen tanks take just five minutes to fill, but remove the limit to the vehicle's potential range.

The fuel cell range extender is located under the bonnet, and converts hydrogen and oxygen into water, creating an electric current. The battery and the hydrogen cell supply electric energy to the motor. The fuel cell activates automatically and can also be activated by the driver when the electric battery charge level drops to 80%. This is to maintain or gradually charge the battery. If the

battery charge falls below 2%, the vehicle can run on hydrogen alone.

“People know that the full EV version works. This approach just addresses the range concerns that some have,” Divine told *Automotive World*. “It takes the EV base vehicle with proven technology and marries that to validated hydrogen technology. It could really extend our potential sales.”

What hydrogen does not offer at the moment is a real cost advantage. “With a full EV, the running costs are up to five times cheaper than an ICE vehicle,” said Divine. “With hydrogen, the running



The hydrogen tanks can be filled in as little as five minutes



costs are similar to diesels or gasoline. The real challenge we are addressing with hydrogen is eliminating the range limit.”

Range over cost

The main advantage, Divine stressed, was around the extended range that will allow delivery companies to complete longer journeys with greater peace of mind, and the zero-emission qualification that will allow entry into restricted zones. “This is a complementary solution to our electric and hybrid strategy,” he added. “We want to offer commercial fleets a new way to access city centres.”

A handful of cities around the world, particularly in Europe, are preparing to enact low- or no-emission zones. Renault’s home market of France is a case in point. In 2025, Paris is expected to ban all diesel vehicles from before 2010, along with a ban on some of the more polluting gasoline-powered cars built before 2006. Beyond that, the

Metropole du Grand Paris council intends to gradually tighten the regulations, allowing only fully electric or hydrogen fuel cell cars within the Greater Paris region by 2030.

Others are taking similar steps. “Some countries have already put in place legislation to ban all combustion engine vehicles,” observed Dominique Bonte, Managing Director and Vice President at ABI Research. “There are big discussions going on today at the European level that would ban all non-electric vehicles by 2030. It hasn’t been approved yet, but we can see that coming.”

Depending on how regulations like this develop, Renault could see strong demand for its new line-up. “There are significant decarbonisation efforts under way,” added Divine. “The sales of these new models will hinge on the speed of both political issues, such as city centre bans, as well as financial incentives and infrastructure. With the Master Z.E. Hydrogen and Kangoo Z.E. Hydrogen offering, Renault is preparing today for the future needs of its fleet customers.”