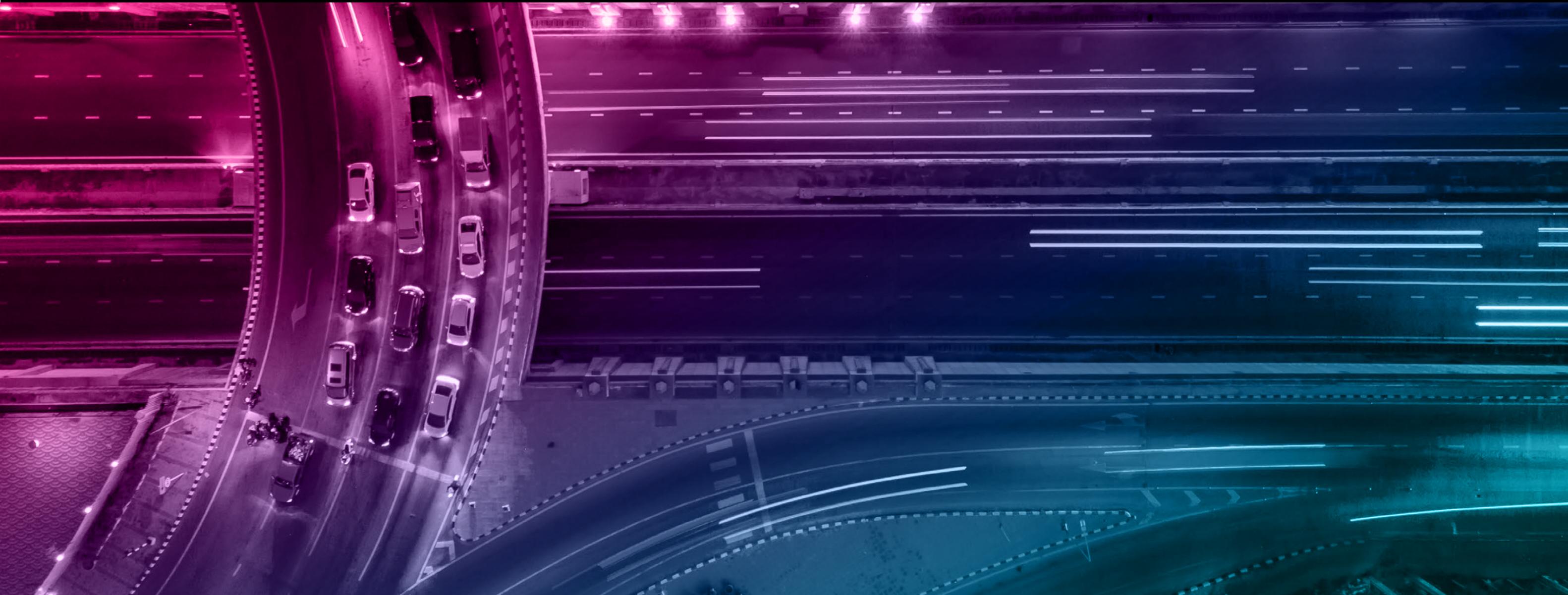




# CONNECTED CAR, CONNECTED FUTURE

Any colour you like, as long as it's connected





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Easy does it

# The revolution will be connected

Cars aren't just cars any more. And no one knows that better than the automotive industry's top innovators. Software-defined cars and next-generation electric vehicles (EVs) are already here, with powerful on-board processors and a growing customer base for new, enhanced mobility services and driving experiences. European legislation mandating eCall – the requirement that all cars have the ability to make emergency calls automatically – has focused minds. But when 39% of customers say they're interested in unlocking additional digital features after buying a vehicle – rising to 47% for customers of premium brand - it's a win-win situation.

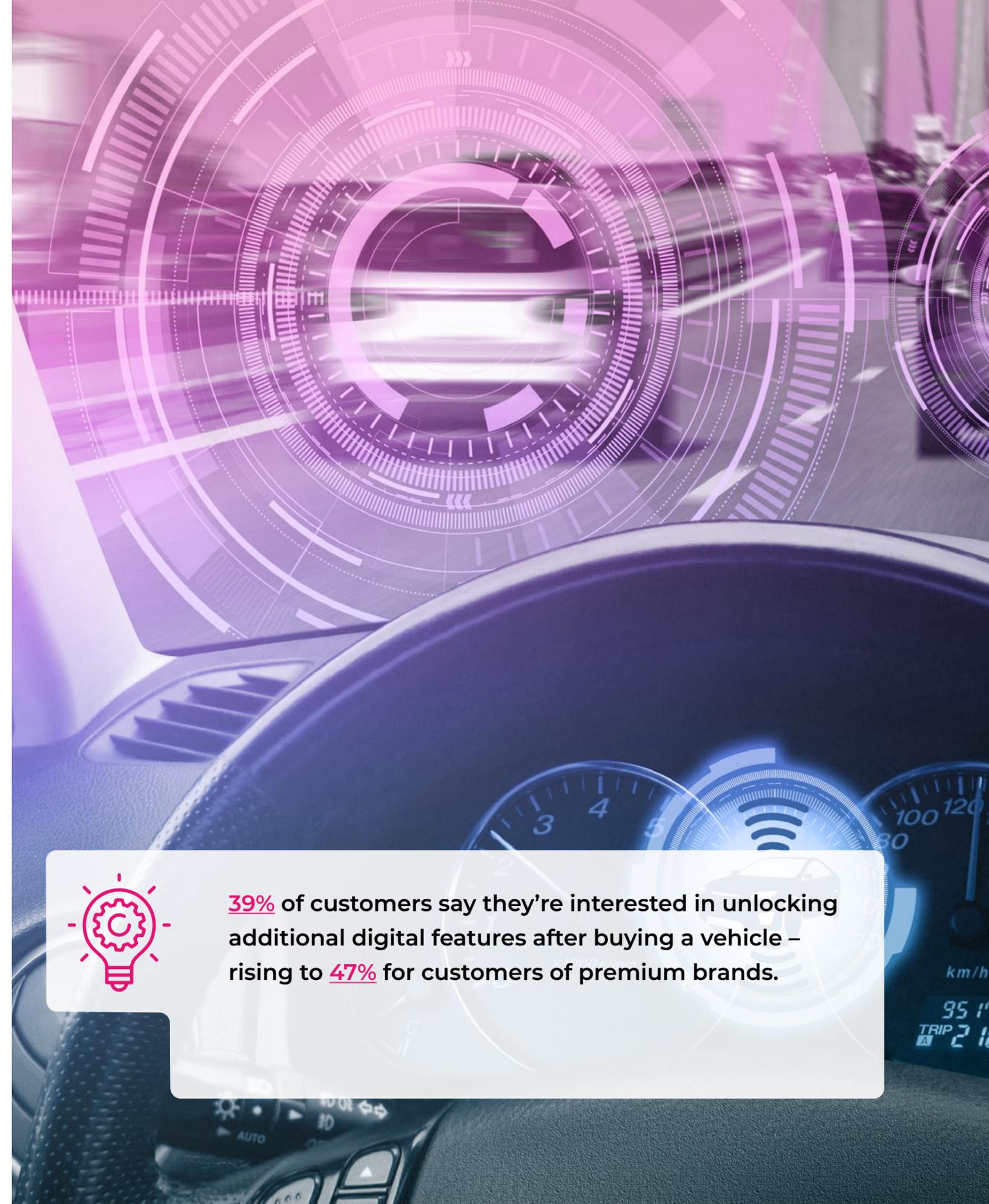
An estimated [470](#) million connected vehicles will be on the road globally by 2025. They're challenging the automotive industry to evolve into new business models where software and services are at least as important as the vehicle itself. It's no longer \*just\* about sensors: there's a whole set of cultural changes taking place around everything from how we travel to how we expect to stay connected on the move, and which services and content we expect to access while we're doing it.

For automakers, this represents a significant opportunity, not only to extend the customer lifecycle far beyond the production line or showroom, but also to transform and refine the customer experience in ways that will drive brand loyalty and differentiate against the mainstream tech players.

The technology is there for automakers to own the customer experience and the ecosystem behind it. This eBook takes a look at just some of the ways they can do that – and some of the challenges they need to overcome to get there.



**39%** of customers say they're interested in unlocking additional digital features after buying a vehicle – rising to **47%** for customers of premium brands.





# 5G

## THE SECRET SAUCE FOR THE CONNECTED CAR'S FUTURE

For some, the software-defined vehicle is *the* use case for 5G networks. It's no accident that some of Europe's fastest 5G networks are found in development centres renowned for automotive excellence. As autonomous vehicles, connectivity, electrification and shared mobility (ACES) continue to disrupt the industry, 5G is accelerating a move to the edge that will do for automotive what 4G did for financial services, streaming and e-commerce services.

5G will disrupt many industries, but its capacity to re-shape automotive is profound: millions of vehicles globally already connect to mobile networks for everything from real-time navigation to in-car entertainment and, increasingly, e-commerce services, including car-as-wallet. As 5G's footprint expands, Vehicle-to-Everything (V2X) and production at the pace of innovation are rapidly becoming realities. Instantaneous, secure transmission of data between cars, humans and machines opens up a realm of use cases, each with their own unique set of possibilities, including:

**Accelerated automation and safety features:** Combined with multi-access edge computing (MEC), 5G provides the backbone for high-end, pre-emptive early warning and assistance systems, enhancing automated driving functionality while unlocking new opportunities and partnerships for connectivity and streaming services.

**Autonomous vehicles and V2X:** The secret sauce for V2X has arrived in the form of 5G and IoT. High throughput and low latency enable the kinds of

connectivity needed to handle multiple sources of data, whether it's other vehicles, traffic lights or emergency services.

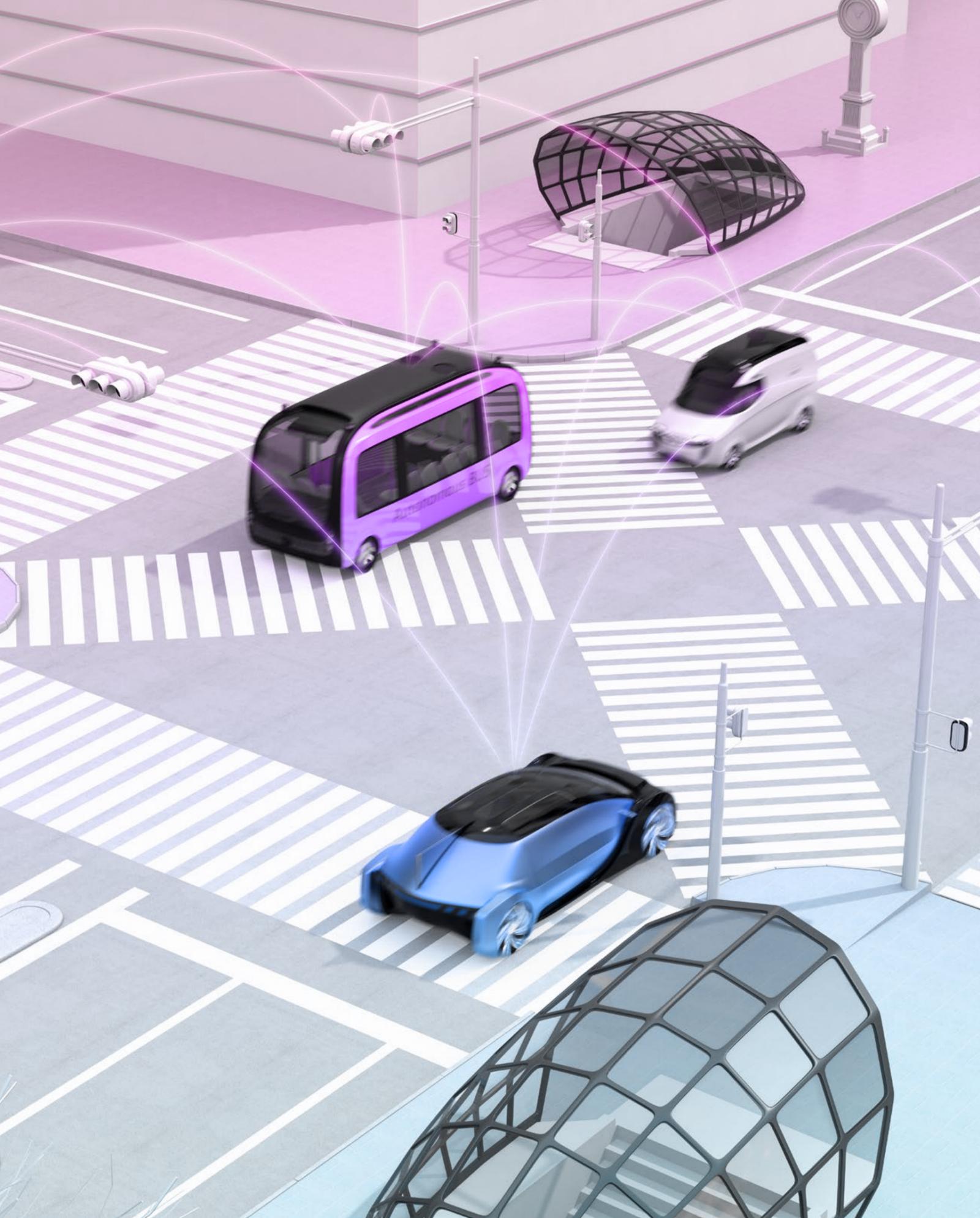
**Transformation of the electric vehicle landscape:** Development and production plants will benefit from enhanced insights and data, enabling improved production, better performance and availability of the infrastructure needed to genuinely transform deployment and consumer uptake, such as battery level monitoring, charging stations and efficient route identification.

**Mobility as a Service (MaaS):** 5G is the heart of the mobility revolution. As manufacturers and governments alike look to reduce carbon footprints, fleets of connected vehicles can ensure more efficient road usage, reduced fuel consumption and improved air quality as consumers share or use vehicles as a service. 5G makes this revolutionary ecosystem possible, enabling MaaS providers to run fleets of vehicles in concert with other transport systems, opening up new opportunities and value propositions for a younger generation for whom a shared use/ pay-as-you-go model will offer broad appeal.

**Vehicle-as-a-Platform for new services and partnerships:** 5G's capacity to transmit data opens up significant downstream digital revenue opportunities that will extend the profitability of vehicles over their lifetime, beyond traditional value-add servicing/parts propositions. Branded marketplaces, content, entertainment streaming and real-time, customer-relevant opportunities all provide new frontiers for partnerships beyond traditional platforms.



**Gartner forecasts that, by 2033, the automotive industry will become the largest opportunity for 5G IoT solutions – and the largest sector for IoT endpoints and use cases – representing 53% of the total market.**



## UNLOCKING 'WHAT'S NEXT' IN AUTOMOTIVE

Today, the car is having an iPhone moment: 5G is enabling an ecosystem of connected services and a new era of software-defined vehicles. 5G's cloud-native architecture supports microservices and more open integration, providing enhanced scalability and interoperability. Multi-Access Edge Computing (MEC) brings compute, storage and networking closer to users, applications and devices, providing the lower latency needed to open up dynamic new innovations and services.

From advanced driver assistance systems (ADAS) to predictive maintenance, remote software upgrades, home streaming and third-party applications, 5G is uniquely poised to enable traditional and not-so-traditional innovation.



# V2X – vehicle to everywhere / C-V2X networks

## DRIVING THE VISION FOR INTEGRATED MOBILITY

Vehicle-to-Everything (V2X) sits at the core of the car's evolution, not just towards autonomous vehicles, but as an autonomous digital platform of its own. A platform capable of interacting with infrastructure, people, and other vehicles, as well as with the network itself – allowing a whole new ecosystem of digital services to be unlocked.

The potential has been recognized for some time, but as 5G's footprint expands, automotive V2X is about to step up and fulfil its promise. 5G's high throughput and low latency can handle the multiple sources of data that will fuel V2X's success - whether it's other vehicles, traffic lights, pedestrians or emergency services. While in-vehicle 5G capability is not-yet widespread, 5G standalone (SA) or in combination with LTE are already opening up the promise of enhanced in-vehicle functionality.

Historically, WiFi-based technologies were earmarked to underpin V2X systems. Over the past couple of years, however, C-V2X (cellular-V2X) has moved to the fore – as the de facto technology behind V2X in China (the world's most advanced V2X market), both Europe and North America have





**The market for automotive V2X is projected to grow from US\$628.9m in 2021 to US\$7,351.9 by 2028 – a CAGR of 42.1% for the period.**

(Fortune Business Insights)



followed suit. Several key components fall under the C-V2X umbrella, enabled by 5G, including:

- **Vehicle-to-Vehicle (V2V)**
- **Vehicle-to-Infrastructure (V2I)**
- **Vehicle-to-Pedestrian (V2P)**
- **Vehicle-to-Network (V2N)**
- **Vehicle-to-Grid (V2G)**
- **Vehicle-to-Device (V2D)**
- **Vehicle-to-Cloud (V2C)**

We're fast approaching a future where vehicles communicate with each other, their surroundings, and anything else that's relevant to either a driver/passenger or broader safety concerns. Accurate, real-time communication to and from vehicles underpins everything.

## **ROLLING OUT V2X-EQUIPPED VEHICLES**

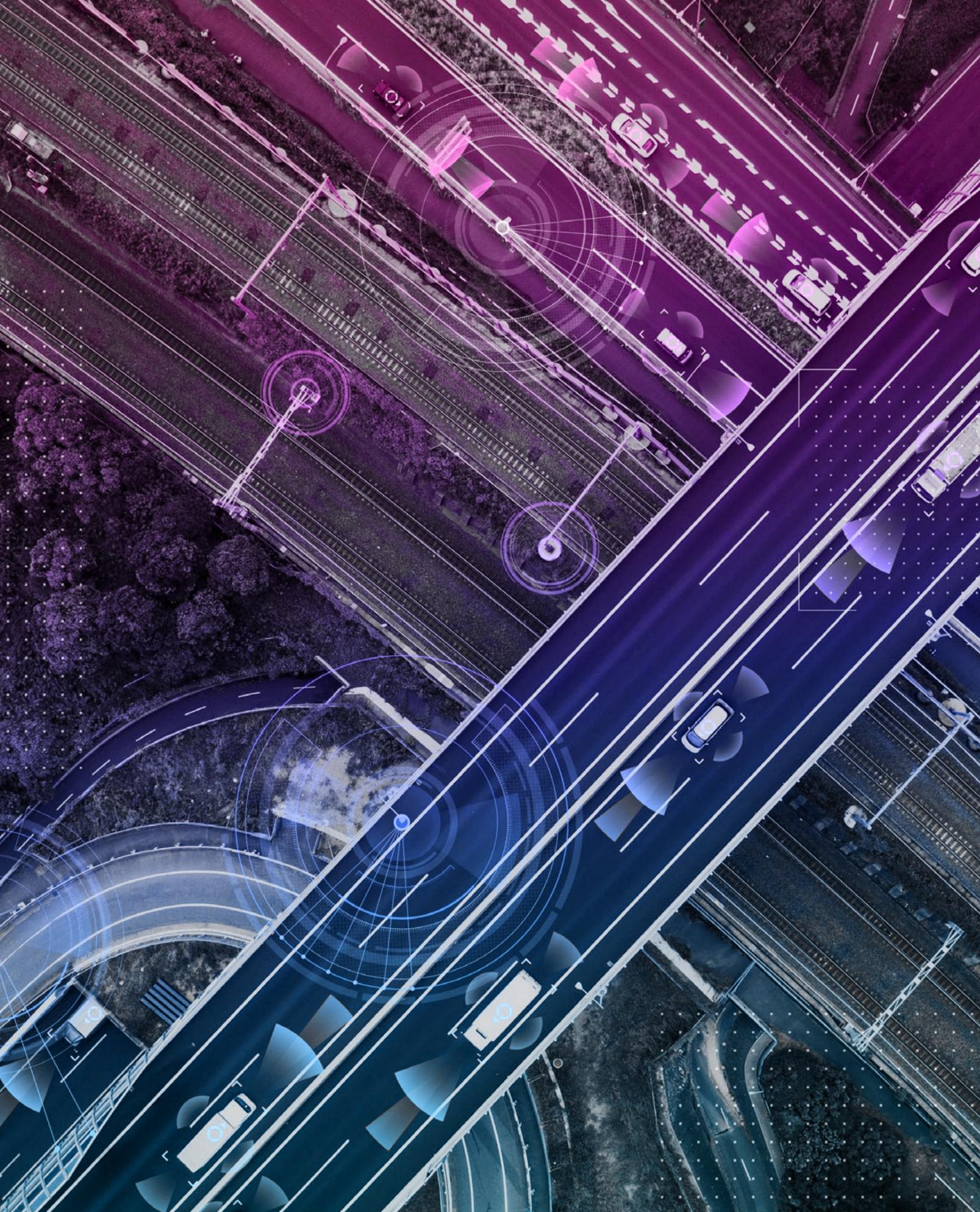
V2X has been added to the 2025 EuroNCAP (European new car safety ratings system) roadmap, all but ensuring the technology's future – [93% of new vehicles](#) sold in Europe are EuroNCAP rated. It's no coincidence that the technology has been mandated by safety-oriented organisations: V2X promises safer, more sustainable transport, along with more efficient journeys and premium in-vehicle experiences. Tech research firm ABI Research projects that 41 million 5G-connected cars will be on the road by 2030, rising to 83 million by 2035.

## DRIVING THE VISION FOR INTEGRATED MOBILITY

Audi, BMW, Ford, Stellantis Volkswagen are among the leading automotive OEMs that have been running large-scale trials and implementing the technologies. In 2022, the 5G Automotive Association (5GAA) ran live trials of 5G cellular connected vehicle communications and multi-access edge computing (MEC) in the USA. Fixed, on-site cameras and sensors were used to collect detailed information to inform what a vehicle can 'see', how systems make decisions and manage safety alerts. All of this paves the way for autonomy, but in the meantime...

Globally, V2X is driving a vision for integrated mobility – the '15 minute city' that supports sustainable commuting, where a user can park their EV at a charging point, take a robo-bus to the centre of town and hop on an e-scooter to finish their journey, without interrupting or disrupting any connected experience they enjoy en route. The higher speeds and greater communications will deliver higher definition mapping – a fundamental component of successful autonomous vehicle development.





# Third-party apps and consumer use cases

## IF YOU BUILD IT, THEY WILL COME

It's often said that Porsche claimed it would rather sell the same car 1,000 times than 1,000 cars. As industry myths go, it's a great story that highlights a certain truth about the future of automotive: software-defined vehicles and next-generation mobility technologies allow automotive OEMs to extend the customer lifecycle far beyond the production line or showroom floor.

Premium features and upgrades present new opportunities to build brand loyalty. Consumer-driven use cases such as video streaming and over-the-air (OTA) map updates represent a new level of connection between customers, the car and the digital world.

## PARTNERSHIPS MATTER

To maximise the opportunities, innovative car makers are rolling out high-end third-party app stores in new vehicles. As we'll see in our section on [home streaming and localisation](#) the challenge here is for automakers to take ownership of the in-vehicle experience, delivering premium, branded services as part of a broader connected experience, rather than sitting back and leaving the traditional tech players to dominate. Some of the areas of B2C services where automakers can really win include:

**Automated/advanced driver assistance (ADAS):** From lane assist to adaptive cruise control, collision avoidance and autonomous driving capabilities, ADAS will be a fixture of the digital cockpit and connected car experience.

**Intelligent traffic systems:** 86% of drivers are interested in accessing real-time traffic and navigation updates, streamed to their in-vehicle console.\*

**Predictive maintenance:** 86% of drivers surveyed would like to have predictive maintenance and personalised care based on their driving habits. 82% are interested in over-the-air software updates for in-car systems.\*

**Parking management systems:** 91% of drivers are interested in smart parking solutions to check availability, book and pay for it.\*

**Infotainment and video streaming:** The in-vehicle infotainment market is estimated at US\$30.47bn in 2022\*

**Car-as-wallet and in-vehicle shopping:** In-vehicle payments are expected to reach US\$6.5bn by 2026, rising to US\$12.6bn by 2032.\*\*

For many automotive OEMs, the key to success will involve building strategic partnerships with third-party technology and connectivity providers who can manage the complexities of providing local content, local internet and local services in line with regional legal and regulatory mandates.

## HIGH VOLUME, LOW LATENCY

As 5G gains ground, in-vehicle consumer behaviour is likely to follow patterns we've already seen with smartphone use – research indicates that 5G smartphone users consume 1.7-2.7 times the data of 4G users. For automakers, this is both a massive challenge and a game-changing opportunity: seamless connectivity and premium, highly monetizable



**37% of customers would switch car brands to gain improvements in vehicle connectivity.**



services can become key brand differentiators. Thirty-seven per cent of customers would switch car brands to gain improvements in vehicle connectivity: delivery high volume, low latency content has the potential to make or break a brand.

Building on 5G and V2X, third-party applications and services are part of a new car-as-platform ecosystem. Between them, they will deliver the enhanced safety, premium experiences and ease-of-upgrade that are the foundation of a new automotive business model.

\*Source: Deloitte – Reimagining success in connected vehicles with a differentiated CX approach.

\*\* Source: FMI – In vehicles payment markey value to grow by almost US\$12.6bn during 2022-2032

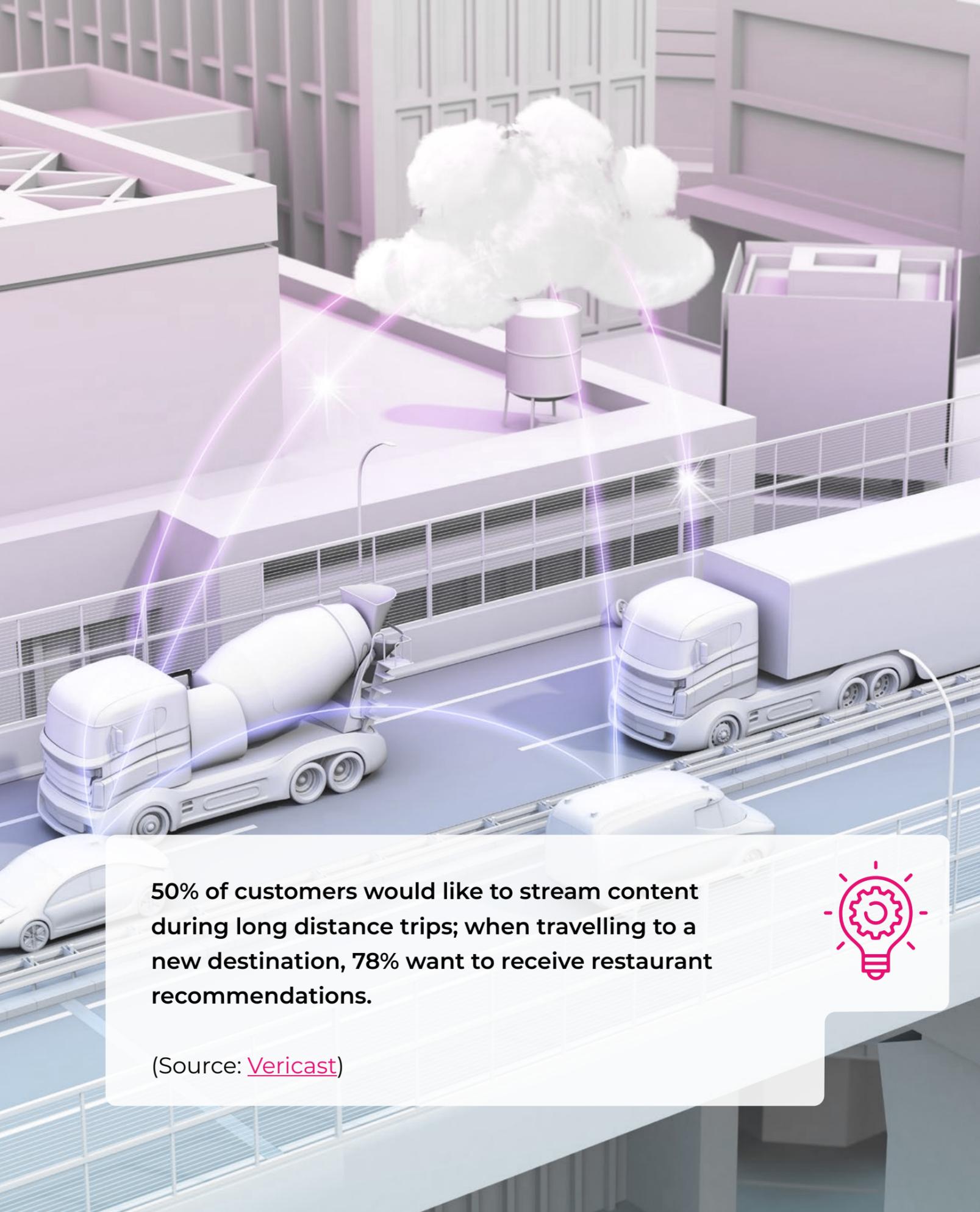
# Localisation and home streaming

## CONTENT IS KING, BUT LOCAL IS EVERYTHING

As digital technologies become key differentiators for automakers, localisation sits at the heart of everything. As premium mobility services are rolled out and automakers take ownership of the customer experience, putting the right services, in the right region, localised, will be crucial. Not only that, but ensuring a consistent experience, even if the car is driven into a different country, brings a whole new set of challenges for automotive OEMs.

Customers are used to experiencing their digital life on-demand. They expect the same digital experience whether they're streaming Netflix from the couch at home or driving in a new town, in a new country, looking for a restaurant that serves their favourite cuisine. When they access premium mobility services or digital personalisation features from their vehicle, they expect it to happen on the same terms as it did before they left the house. Wherever they happen to be driving.





**50% of customers would like to stream content during long distance trips; when travelling to a new destination, 78% want to receive restaurant recommendations.**

(Source: [Vericast](#))



## IT'S COMPLICATED...

For automakers, meeting the localisation and home streaming challenge can be complex. Shipping cars globally while ensuring highly personalised experiences from almost the moment the customer turns the key is complicated. Ensuring that every experience – from seamless connectivity to localised internet and the content itself – complies with local regulatory requirements adds to the complexity. Do you want to negotiate with multiple vendors in diverse geographies and hope you lock in the right pricing? How do you address the increasing costs and potential latency associated with high-bandwidth services and roaming? Is permanent roaming even allowed in your key markets?

All of this has to happen with minimal disruption to the end user. To deliver a user journey that follows the home country, automakers need to solve for local – on a global scale. They also need to achieve this with one foot in their legacy/current fleet camp, and one in the cars that will be rolling off the production line in the near future. To achieve all this, automakers will be looking for connectivity management and technologies that are future proof, flexible and remote, including:

**Remote software updates:** With vehicle lifetimes of 15 years -possibly more, with new technologies, use cases and extended customer lifecycles – automakers will need connectivity services capable of supporting in-vehicle communications modules and fleets for similar periods.

**Flexible subscriptions:** When the technology is moving fast, future-proofing matters. Dependence on a single MNO or connectivity provider runs the risk of locking automakers into services that can't scale or become too expensive over time. The ability to change subscriptions on SIM modules over the air ensures that automakers can move entire fleets from one provider to another.

**Highly cost-effective:** Negotiating with multiple MNOs for the best price is complex: too many vehicle variants, too many contracts with too many local providers all create management and other overheads that undermine margins and limit the pace at which new services can be rolled out.

**Local (and legal) everywhere:** Some countries have a blanket ban on permanent roaming, others have highly complex tax laws specific to the telecoms sector. Others still have stringent rules around data collection, storage and use. Some require specific subscriptions for eCall.

## THE FUTURE IS LOCAL AND GLOBAL

In this context, split billing and local breakout (LBO) are becoming key capabilities underpinning success. Automakers that can introduce more connectivity services over time without incurring higher roaming costs will be able to establish clear differentiation in a market where the software and connectivity capabilities of any vehicle are set to become brand-defining. Car localisation is going global, and the OEMs that can do this will secure customer loyalty.



# Assisted and autonomous driving

## FROM HERE TO AUTONOMY

All of the technologies discussed in this eBook converge in one place: autonomous vehicles. While the technology that will eventually enable self-driving vehicles is advancing rapidly, there's a long way to go before 'hard to code' challenges, such as difficult-to-predict safety scenarios are overcome.

None of this prevents innovation around autonomous features, however: from advanced driver assistance capabilities to enhanced braking, acceleration, steering, lane management and advanced safety features, research by the American Automobile Association indicates that 58% of drivers want these systems in their next vehicles. And while 80% want current systems to simply work better, only 22% believe that automakers should focus on self-driving vehicles. While some forecasts predict that as many as 15% of new vehicles will be fully automated globally by 2030, the reality is that there's a lot of complexity to overcome before autonomous vehicles are a regular presence on public roads.

For now, innovative car makers are leading with active assistance systems, including:

- **Adaptive cruise control**
- **Hands-on lane-centring steering**





**Automotive applications will account for 53% of data transmitted over 5G by 2023.**

(Gartner)



- **Hands-free steering**
- **Intelligent speed control**
- **Highway assist and traffic jam assist**

Most manufacturers are offering – or considering – subscription models for advanced services and software. Many Tesla models are eligible for a full self-driving function, when it eventually ships. Audi, BMW and Mercedes are among the leading brands offering digital upgrades for everything from lighting systems to over-the-air map updates and online speech processing.

## **HIGH BANDWIDTH, LOW LATENCY IS CRUCIAL**

BMW has stated that 5G technologies are a prerequisite for autonomous driving. And while most OEMs acknowledge that partially- autonomous and enhanced driver technologies offer the most realistic vision of what the next decade is going to look like, even this level of sophistication is going to require the ability to manage high data volumes and low latency.

The data generated by a near-constant feedback of sensor and user data will make 5G capability a key factor in success at every stage of the autonomy journey: Gartner estimates that automotive applications will account for 53% of data transmitted over 5G by 2023.

It's not just behind the wheel, either: 5G is revolutionising manufacturing within the car industry, transforming productivity, speed and efficiency. Leading automotive OEMs are implementing private 5G networks both for their own manufacturing processes and to test future innovations in near-real-world conditions.

## 5G IS THE KEY

5G is poised to deliver the ultra-reliability and bandwidth needed to support next-generation ADAS systems and future self-driving or autonomous driving capabilities. But while the driver remains in complete control, it's 5G's capacity to bring new services and functionality to life that will capture the most attention from consumers.

The sheer volume of data created by cars and users alike creates the ultimate feedback loop that will generate new insights and learnings capable of feeding the next-generation of improvements and innovations.



# Why Cubic

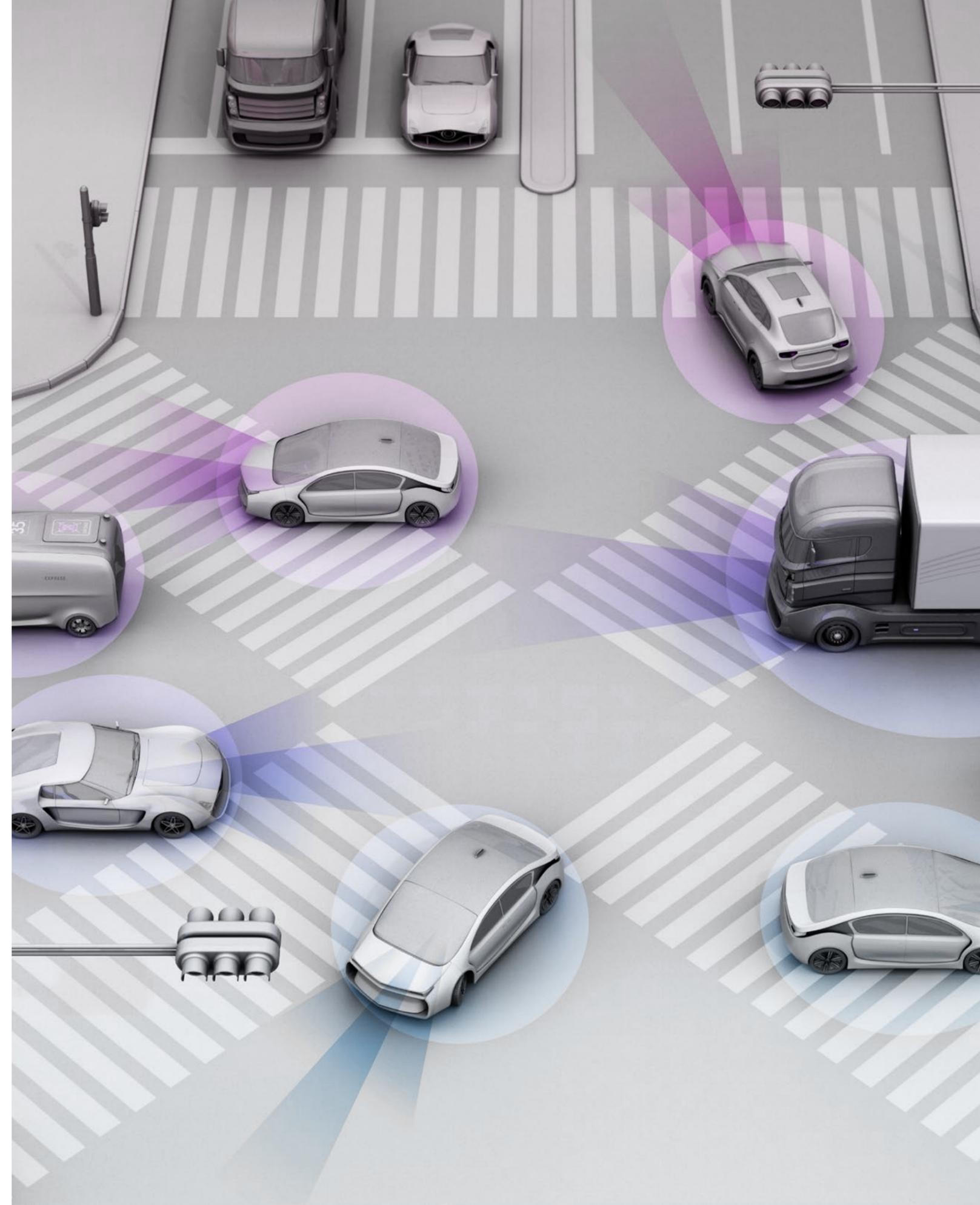
## EASY DOES IT

Cubic's connectivity and analytics solutions help some of the world's leading automotive, agriculture, transport and IoT device brands to manage and deliver premium mobility services anywhere in the world – simply and effectively.

Our single software solution allows any vehicle shipped anywhere in the world to have built-in compliance across local markets, extend lifecycle value and drive competitive advantage.

## BE LOCAL EVERYWHERE. WE ARE.

Cubic connects over 9.5 million vehicles and devices in 190 countries worldwide. With core networks in countries with particularly complex requirements, Cubic's customers gain access to our global portfolio of Tier 1 mobile network partners in more than 190 countries worldwide. We offer complete flexibility to compose your connectivity ecosystem with preferred partners – select your own MNO across regions and negotiate your own data pricing if required. Whatever you choose, you'll be fully compliant with tax and telecom regulations in all countries.





## WE KNOW YOUR BUSINESS

Cubic's award-winning technologies are industry-proven, technology agnostic, connectivity platforms designed specifically for automotive IoT use cases. That's why we're the partner for choice for some of the world's leading brands.

## OUR TECHNOLOGY

**PACE** – our connectivity platform uniquely provides seamless integration with OEM IT business systems and enables remote device connectivity management, with minimal embedded SIM SKUs across the manufacturing and supply chain.

**PLXOR** - our PLXOR analytics platform enables global split-billing functionality, allowing vehicle manufacturers to tailor pricing strategies and offer personalised content packages.

**Insights** - our Insights platform gives OEMs the connected intelligence they need to optimise customer experience, alerts and performance monitoring

## THINK ABOUT IT. WE DO.

To compete globally, automotive OEMs and device manufacturers must negotiate agreements with multiple operators in different geographies. They have to manage the complexities of connecting with different telecoms technologies while complying with regulatory and operational mandates in each country. Cubic completely cuts through that complexity, providing a single, global solution that enables any vehicle shipped anywhere in the world to have built-in compliance across local markets – from regulatory to tax requirements.



# ABOUT CUBIC TELECOM

Cubic Telecom delivers innovative IoT connected software solutions to Automotive, Agriculture, and Transport manufacturers. Its ecosystem of revenue-generating services combines real-time analytics with global connectivity in 190 countries, always aligned to regional regulatory requirements.

Its global connected software platform PACE is used by leading companies around the world including Audi, Microsoft, Kymeta, Panasonic Automotive, Volkswagen, CNH Industrial, Skoda, e.GO Mobile and Arrival.

Headed by CEO Barry Napier, the company is privately held with over €110 million in funding by Audi Electronics Venture GmbH, Qualcomm, Valid, the European Investment Bank, Enterprise Ireland, and the Ireland Strategic Investment Fund, among others.