



Giesecke+Devrient

# eSIM and the Connected Car

The foundation for ultimate digital security

White Paper



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## The foundation for ultimate digital security

The automotive sector, and its customers' expectations are evolving, faster than ever before. In-car entertainment, information and technologies were once seen as optional extras for luxury vehicles, but now the market requires these sophisticated systems and technologies at every price point. Automotive OEMs are rapidly realizing that competition for customers will be dependent on the provision of connected services. However, rich media and edutainment services are impossible without providing data connectivity.

Connected cars, where driving operations and in-vehicle services are enhanced and delivered by network connectivity, are in a period of unprecedented growth. Strategy Analytics predict that approximately half a billion connected cars will be on the road by 2023<sup>1</sup>. This rise in 'smart' vehicles and their supporting industries, software vendors, and network operators reflects both the wider availability for reliable data connectivity and the dominance of today's 'always-on' culture.

The global availability of 4G connectivity means that a significant portion of the automotive market will have access to fast, reliable data speeds for the majority of their journeys. This network-rich environment ensures that more sophisticated and data-dense services can be offered to the driver or passengers. Anything from rich media experiences to telematic-driven driver assistance and mapping will soon be common in most new vehicles. The imminent rollout of 5G infrastructure, with increased speeds and lower latency, will also increase the sophistication and reliability of these services.



# 500m

Strategy Analytics predict that almost 500 million vehicles will be connected by 2023.

<sup>1</sup>Strategy Analytics 2019

continued...

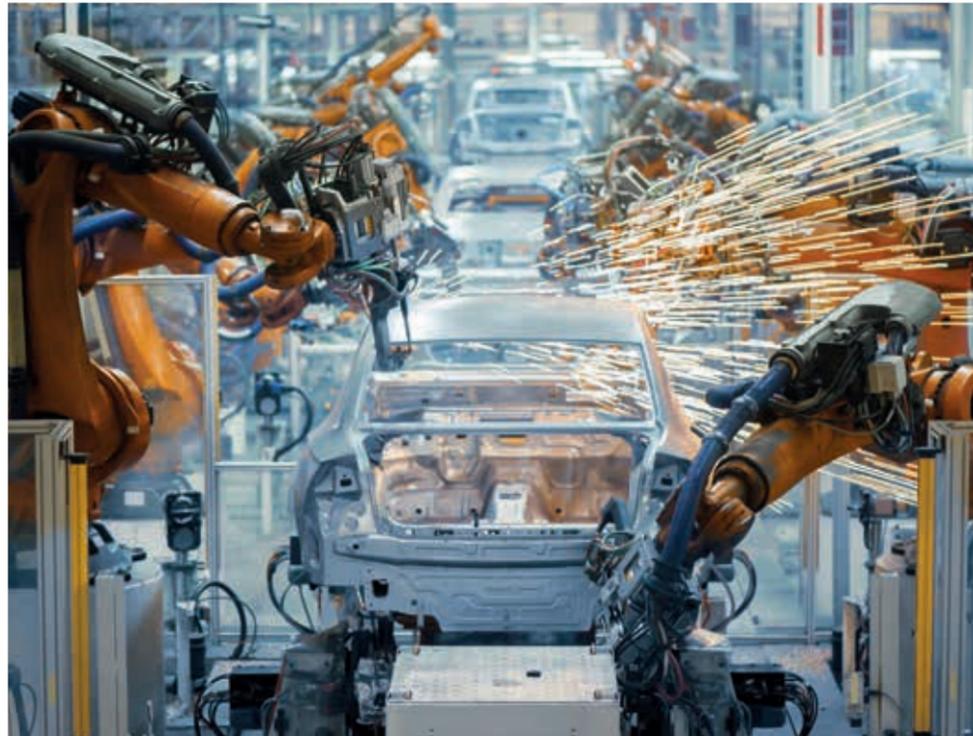
The shift to an information society has created a culture where sophisticated, personalized digital experiences are seen as essential requirements. We expect a digital service to know us and our preferences, adapting its offer to customize our experiences. For drivers, this might mean a GPS and mapping solution that has learned our routine and automatically displays the best route to our usual destination.

This tendency toward personalization does not come without risk. In using these services, the driver of a connected car might share a vast amount of data, from driving preferences and vehicle operation to financial, address and contact information. An absolute priority for any connected car provider must be securing this data, ensuring it can only be accessed for the right purposes and by the right people. Legislations such as the EU's General Data Protection Regulations (GDPR) place the responsibility for data security on the entire connectivity and data chain. If an automotive manufacturer offers a service that processes personal data, or even passes Personally Identifiable Information (PII) to a third party, they must ensure that this data is processed fairly and in line with regulation. The industry will only be able to realize the benefits and power of this data as long as they deliver full compliance – without making processes too complex for the customer.

Striking a balance between innovation, availability and security can be a challenge for the connected car market. This whitepaper explores how the adoption of eSIM technology can help to enable secure connectivity without sacrificing speed of technological development and benefit the entire connected car ecosystem.

# 5G

**This network-rich environment means that more sophisticated, information and data-dense services can be offered to the driver. This could provide anything from rich media experiences to telematic-driven driver assistance and mapping.**



# The challenges of the connected vehicle market

Most car manufacturers have invested heavily in developing connected services, usually in conjunction with a technology partner. Whether it's autonomous 'self-driving' vehicles or rich-media augmented driving experiences, there are fundamental obstacles to market entry. Here are some of the biggest challenges facing the connected vehicle industry today:

## 1. Data volumes

The amount of potential data that a vehicle could generate is massive, and over time that figure could increase exponentially. Intel predicts that an autonomous vehicle running cameras, RADAR, LIDAR, SONAR, GPS and 4G/5G connectivity could generate in excess of 4TB of data per day<sup>2</sup>. This means not only large-bandwidth connectivity is required, but also more in-vehicle processing power. Driver-operated connected cars may not need this raw power now, but as technologies progress, connectivity and computing requirements will remain a challenge for connected vehicles.

## 2. The connectivity business model

The connected car market is complex, spanning manufacturers, software providers, network operators and many more participants, each having a stake in revenue generated from connected services. Is data billed to the end user by the manufacturer, or by the network operator? Can the vehicle owner move their connectivity from one provider to another? What happens when the customer takes their vehicle abroad? These questions are critical and as the market matures, customers will expect a broad consensus on the business model across the ecosystem.

## 3. Innovation speed

The development cycles for the automotive industry and the telecommunications industry operate on completely different timescales. Automotive manufacturers generally operate on 3 to 5-year development cycles, whereas smart devices are in a constant cycle of upgrades and improvements. Vehicle makers and technology partners will be cautious of incorporating today's cutting-edge technology into their latest prototypes, as it might be obsolete by the time the car hits the market.

## 4. Connectivity and legislation

Governments and regulatory bodies are beginning to make complex and often contentious decisions on connectivity methods, such as the EU's decision to endorse the 802.11p Wi-Fi connectivity standard for connected cars, a decision which was recently reversed in July 2019<sup>3</sup>.

The USA's National Highway Traffic Safety Administration, in an attempt to understand and assess the impact of connected cars, have defined a framework of stages of change that connected technology will pass through, before autonomous vehicles are fully integrated onto US highways<sup>4</sup>.

Governments are also embracing opportunities that connected cars can bring for better emergency service responses in case of accidents. The EU have mandated that all vehicles manufactured from April 2018 onwards be fitted with an eCall system that automatically alerts emergency services in the case of serious accidents, providing location, direction of travel and vehicle make and model<sup>5</sup>. The challenge for the connected car industry is that governments are deciding different connectivity approaches and standards, all at different times.

## 5. The sharing economy

The way people approach the automotive market is changing, shifting away from car ownership to viewing mobility as a service. Ride-sharing and on-demand rental services like ZipCar, Uber and Lyft have revolutionized transportation, especially in densely-populated urban areas. McKinsey report that the global car sharing industry has experienced a 600% increase in revenue since 2013<sup>6</sup>. Customers in urban areas are moving to pay-per-use models and are less likely to buy vehicles. As the mobility-as-a-service market matures, manufacturers face a future declining consumer sales and specialized service companies becoming their 'fleet-owning' target market.

<sup>2</sup> Intel editorial

<sup>3</sup> Mobile World Live

<sup>4</sup> National Highway Traffic Safety Administration

<sup>5</sup> European Union

<sup>6</sup> McKinsey

# eSIM: Securing the future of the connected vehicle

Changes in hardware standards have always been a barrier to speedy development – and changes in SIM cards are no exception. Traditionally, the physical SIM card would be hard-wired into the vehicle, meaning that it would be impossible to change network providers once the vehicle is manufactured. Adopting a flexible solution like eSIM with digital profiles can remove this obstacle, making embedding connectivity in your vehicle production a more agile, cost-effective solution. Adopting eSIM solutions can also bring significant benefits to both the end customer and the automotive market itself.

With access to data connectivity, today's connected cars offer many opportunities to improve the onboard experience for both drivers and passengers. Entertainment, safety services, access and operation services, or services that interact with other vehicles or road infrastructure, known as vehicle-to-everything (V2X), all become attractive propositions. In some cases, these become essential requirements for new vehicle owners and operators. For example, the UK in 2017 changed all practical driving tests to incorporate navigation using satellite navigation systems. These technologies need both a method to access external networks, and a method for security and authentication of a users' personal data – making eSIM solutions a perfect fit for in-vehicle connectivity<sup>7</sup>.

Today, McKinsey report that only 12% of cars are equipped with embedded connectivity and revenue generation is still in its early days, with less than 1.5 billion USD revenue generated to date. However, their report goes on to say that the importance of cars being part of a connected network is growing, and the percentage of customers willing to swap car brands for better connectivity has doubled over the past two years<sup>8</sup>. As the car becomes an extension of the consumer's digital life, customers expect more connectivity and are focused on ease of use. They expect personalized user experiences and flexible connectivity in the car and are interested in features that save them time and money. Embedding separate SIMs for automakers and consumers opens new usage and business models. This helps to build trust as you provide a convenient, digital experience for your customers. Let your customers bring their data plan to the car and make it easy and convenient for them. OEMs that offer their customers network access based on an eSIM solution are able to offer services with more flexibility and choice.

Unlike traditional hardware SIM cards, which are typically locked to one network operator, eSIMs can be updated OTA in real time with new network provider details. This flexible approach offers benefits for end customers, as well as the OEMs themselves. Using eSIM-managed connectivity, aftermarket and third-party applications can be downloaded, managed and operated by users through in-vehicle software interfaces, enabling end users to safely and securely access rich connected car applications as soon as they become available. Use cases such as real time traffic alerts or parking availability apps can be swiftly implemented. All applications are handled by the same hardware, and are fully certified, so your customers can use them straight away, offering the perfect user experience.

## The eSIM and autonomous vehicles

The connected car offers a wealth of services to improve and enrich the driving experience. However, concerns have been raised about the possibility of hacking and security vulnerabilities, as more and more components of the vehicle are managed electronically. These fears are especially acute in driverless vehicles, where the passenger has no input into vehicle control.

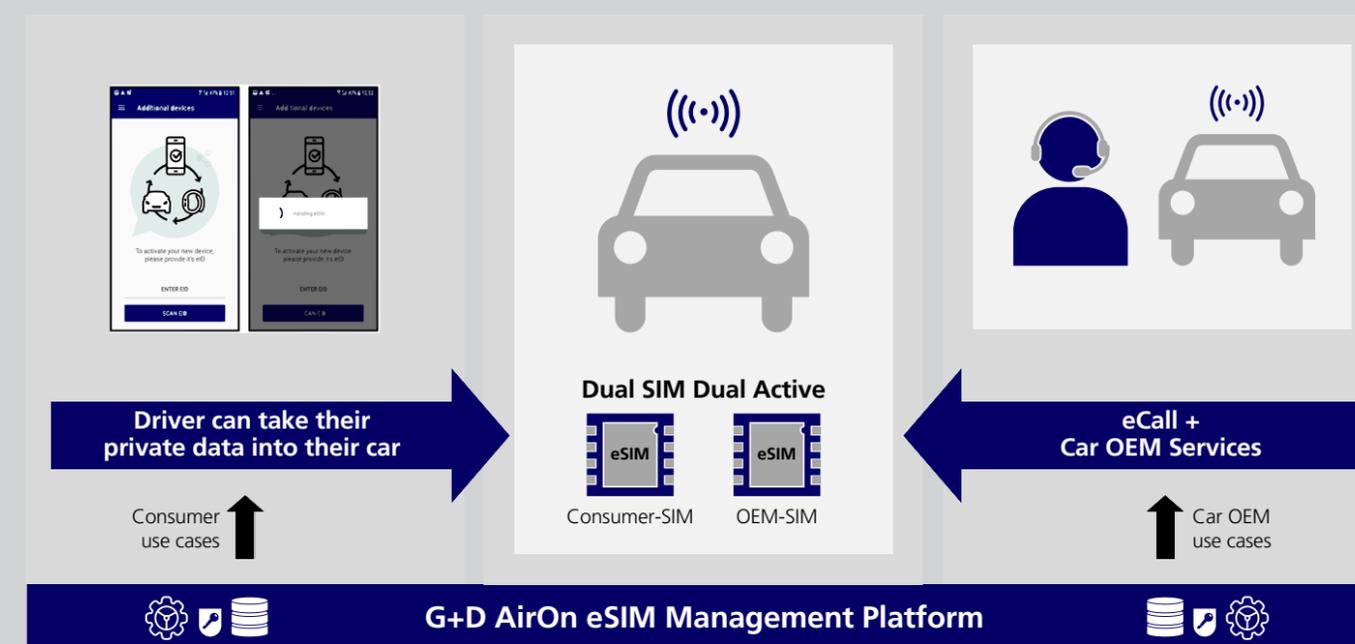
Although true autonomous vehicles are a few years away from commercial deployments, experimental vehicles, pilot programs and services have been deployed by vehicle manufacturers around the world. The Georgia Institute of Technology predict that as driverless vehicles become widespread, hacking might focus more on generating widespread traffic jams and disruptions rather than attacking individual vehicles<sup>9</sup>. Employing eSIM-based technologies would allow anti-hacking and security updates to be deployed, reducing the impact and threats of external penetration.

# Improving the customer experience of in-car connectivity

## In-car connectivity in action

In the future, connected cars could have independent eSIMs for both the car and the driver. This second embedded SIM allows consumers to use their private data plan in the car. In essence, the car becomes a mobile device and part of the consumer's data plan. Connecting is seamless and intuitive as the eSIM automatically activates when drivers enter the car and deactivates when

they leave the car. No more hassle or fumbling with connectivity such as complex Bluetooth pairing. Your customers can use the mobile services such as music streaming that they regularly enjoy. The added benefit is that this service is not limited to one person but can be linked to multiple device IDs so, for example, younger family members can easily access the entertainment system or watch a video.



<sup>7</sup> Gov.uk

<sup>8</sup> McKinsey

<sup>9</sup> Forbes

# Why choose eSIM solutions?

Adopting eSIM solutions for connected car services optimizes production, sales and service processes. eSIM solutions enable new revenue streams and business models and allow manufacturers to keep pace with the constantly innovating digital services market. This adaptable approach ensures their vehicles and services are fit for the future, all without compromising customer security and privacy.

- **Cost-efficient, speedy deployment to global markets**

Centralized manufacture can save time and money. Vehicles can be manufactured centrally, with identical components, shipped worldwide, and only configured with the required eSIM profiles once the vehicle reaches its intended sales destination. Using standardized components not only reduces costs and reduces the time it takes to bring a new vehicle to any market, it enables the vehicle's SIM profile to be securely and quickly updated where required as it crosses between cellular networks.

- **Regulatory compliance**

The complexity of working with regulatory and standardization bodies grows when manufacturing for a global market. Individual regions will have their own laws, standards and assumptions, all of which must be considered in the manufacturing and production processes. eSIM solutions will allow you to more easily deliver a truly global market offering by providing true flexibility to adapt to local regulatory concerns. For example, in Russia communications for automated accident alert services must be routed over the domestic ERA-GLONASS network. The relevant network profile is simply loaded onto the embedded SIM installed in cars destined for Russia, where it sits alongside the local MNO eSIM profile for all other communications.

- **Flexible connectivity management**

An eSIM-equipped vehicle, supported by an eSIM Management solution, offers unparalleled flexibility and adaptability for connectivity solutions. Throughout the vehicle's lifetime, it can be continually updated as new software capabilities and services are developed. Building on this agile, responsive connectivity management, additional services can be offered that rely on connectivity, such as remote diagnostics or real-time navigation.

- **Provider-agnostic solutions**

As new network and carrier profiles can be enabled remotely through eSIM management services, connectivity providers can be quickly and easily changed, often in real-time. This adaptability is of particular value to the commercial vehicle and fleet management markets. It can enable seamless roaming for vehicles that cross international borders. Enterprises with geographically distributed vehicle fleets can change carriers in line with commercial business decisions without needing a costly or time-consuming recall and upgrade process. This simple fleet management approach will make any automotive manufacturer more attractive to enterprise-level buyers.

- **New revenue opportunities**

Enabling connectivity-based applications through an eSIM provides the automotive industry with the opportunity to bring new services and revenue streams to market. Analytics-powered aftercare and vehicle servicing, or even new in-car services and solutions for media management, navigation and safety are simply and securely deployable through the eSIM, Secure Element and Management software. These services are increasing in popularity. Statista Research estimate that, by 2023, the amount of vehicle services subscriptions will grow from 21 million in 2018 to over 64 million in 2023 worldwide<sup>10</sup>. The eSIM provides the opportunity for automotive manufacturers to broaden their business models and develop a whole-lifetime relationship with their markets, increasing brand loyalty.

- **Secure, future-proof and tamper-resistant**

The physical chips that enable eSIM services are embedded during vehicle production. As an isolated hardware module, these SIMs are tamper-resistant and ensure a robust, secure platform for connectivity throughout the entire lifetime of a vehicle. The eSIM ensures data and keys stored and executed within it are secured against hacking and unauthorized access. This approach coupled with G+D's secure remote management services allow flexibility and innovation.



## The connected car and telematics

The opportunity for connected cars to transform mobility is vast, making the driving experience safer, easier and more comfortable. Data from sensors both inside and outside the vehicle can power the algorithms that enable driver alerts, assistance and advice. Everything from monitoring driver fatigue and recommending a rest stop, to parking smart assistance and the detecting of external hazards can be implemented. The real transformative approach becomes apparent when these services are seamlessly integrated to offer the driver smarter decision making. For example, information about driver fatigue could be combined with external traffic data and vehicle engine diagnostics to make the best overall recommendation. It could suggest the driver doesn't stop at the next available rest stop, but instead continues for an additional 10 minutes to the gas station to rest while refuelling and resuming their journey with a minimum of disruption. These more intelligent decision-making tools rely on integration between external and internal data. All of this can be effectively managed with software profiles managed by an eSIM solution.



# 64m

Statista predict that vehicle services subscriptions will increase to 64 million worldwide by 2023.

## Understanding G+D's eSIM solution

Unlike traditional SIM cards, the eSIM or embedded Universal Integrated Circuit Card (eUICC) is a secure chip embedded in the hardware of a vehicle that can host multiple network connectivity profiles. The eSIM supports remote SIM provisioning and manages any updates to a vehicle's operating system and applications. It is also capable of managing identity authentication and cryptographic keys securely, quickly and effectively. G+D's robust eSIM management platform allows vehicle manufacturers to manage, update, or remove eSIM profiles securely and repeatedly over the air across the entire lifetime of the car. As a result, it becomes easy to streamline productions and global operations as vehicles can be manufactured centrally and updated

with local network SIM profiles once the vehicles arrive at their intended sales destination. Automotive OEMs and network operators can also handle exceptional requirements such as country-specific regulations on roaming and network access more easily. The eSIM solution is built on the most widely distributed and secure application delivery platform in the world (UICC), which is certifiable and specified by the GSMA. While it provides secure cellular connectivity, it also offers the security advantages of an embedded Secure Element (eSE). As such, it can be additionally used to enable secure services for various applications across multiple customer needs. For example, car toll payments, user authentication in the car for access to media and entertainment services, identity management for vehicle personalization, or keyless entry and vehicle operation all become possible.



# Managing identities in a connected world

As a global leader of identity management services, G+D ensures that digital identities and data remain secure and reliable at all times across industries. G+D brings comprehensive solutions that enable you to position yourself as a key player in the marketplace, ready to respond to the threats posed by agile game changers entering the market. G+D started its connected car SIM journey globally in 2012. Today every 3rd connected car globally connects to a network using G+D technology. G+D's automotive grade products that have been launched since 2010 are all produced in G+D's TS16949 certified production site. G+D is a member of the Car Connectivity Consortium.

Building on our core competencies of experience, interoperability and standardization, we've built effective and lasting relationships throughout every stage of the production process, from silicon vendors all the way through to the end user. G+D hold an effective eUICC market share of more than 90% in the consumer market. Pioneering the development of eSIM management for many years, G+D now manages over 10 million vehicle SIMs. Whether you are at the early stages of developing your offering or looking to deepen and develop your investment in connected services, G+D can help.

# 10m

G+D manage more than ten million vehicle SIMs worldwide.

# 1 in 3

Connected cars around the world use G+D solutions.



# Managing identities in a connected world

G+D Mobile Security is a global mobile security technology company headquartered in Munich, Germany. The company is part of the Giesecke+Devrient group. G+D Mobile Security has a workforce of 5,300 employees and generated sales of approximately EUR 877 million in 2019 fiscal year. More than 40 sales and partner offices as well as 20+ certified production and personalization sites and data centers ensure customer proximity worldwide.

G+D Mobile Security manages and secures billions of digital identities throughout their entire life cycle. Our products and solutions are used by commercial banks, mobile network operators, car and mobile device manufacturers, business enterprises, transit authorities and health insurances and their customers every day to secure payment, communication and device-to-device interaction. G+D Mobile Security is a technology leader in its markets and holds a strong competitive position.



**Giesecke+Devrient**

Giesecke+Devrient Mobile Security GmbH  
Prinzregentenstrasse 159  
81677 Munich  
Germany

[www.gi-de.com/mobile-security](http://www.gi-de.com/mobile-security)  
[mobilesecurity@gi-de.com](mailto:mobilesecurity@gi-de.com)

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