Digital Trends in the Automotive Industry

Full Speed into the Digital Future

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Deutsche Telekom IoT
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Trends & Topics

Free Ride for the Internet of Things

Future-Proof with New Technologies

Radical Change in the Automotive Industry

The automobile industry faces enormous challenges on a global scale. Following a decade of stable growth, OEMs and suppliers have reported declining sales since 2018. The current pandemic has created serious additional problems. Supply chains have been interrupted or have collapsed entirely. Half a million auto workers have been put onto short time in Germany alone. Demand for new vehicles has continued to decline concurrently. In Germany only 3.4 million cars will likely be manufactured this year; the lowest total since 1976.[1]

New Partnerships for New Challenges

At the same time, radical changes emerging on several fronts are tagged as ACES (Autonomous, Connected, Electric, Shared) transformation. The trend toward alternative powertrains and the future scenario of autonomous driving pose structural and technological challenges for manufacturers and suppliers who are increasingly competing with software groups and IT specialists – or cooperating with them in order to remain competitive. VW and Siemens, along with Amazon, are developing the Industrial Cloud, a platform to provide Volkswagen production facilities with software applications for plant, machinery and tools. Microsoft too is in demand as a partner. BMW has used Microsoft Azure to produce a digital ecosystem around customers and vehicles. Daimler is processing data from its value chain in the Microsoft Cloud with AI assistance. And Audi, BMW and Daimler have taken over Nokia's Here navigation division as an alternative to Google Maps. These are all partnerships as the key to future success.

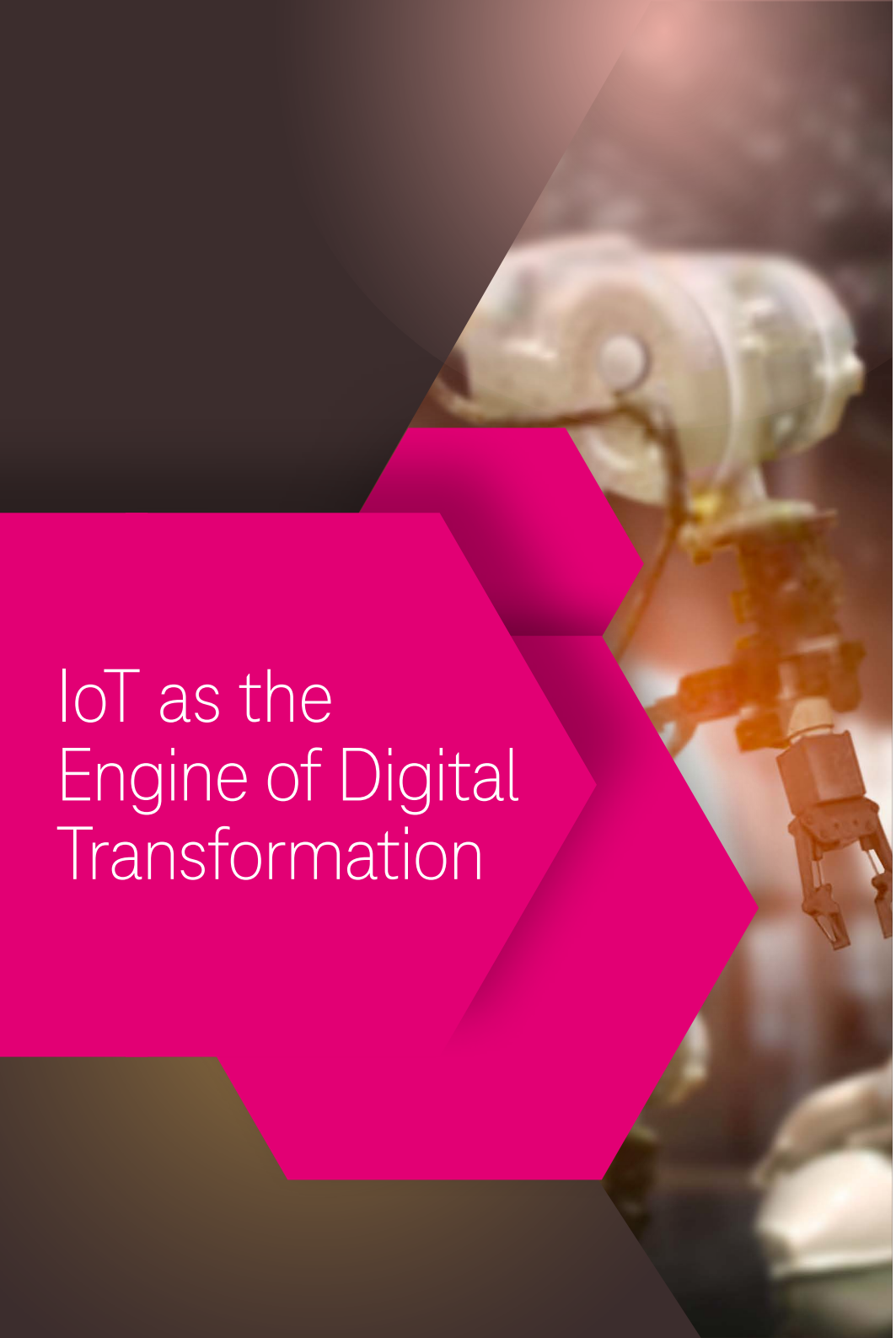
Strengthening the Customer Experience

Future Focus on Customers' Wishes

A further factor is change in customer behavior. More and more people support sustainable mobility and are moving away from the combustion engine to the electric vehicle. For the younger generation in particular, the car is no longer the status symbol it used to be. Fewer and fewer people want to actually own a car; they are mainly interested in getting around as flexibly and effectively as possible. Alternative mobility concepts are booming and car use is increasingly combined with travel by bus, train and bicycle.

Customers also want the digital services to which they are accustomed from their smartphones, to be able to use the same apps and streaming facilities seamlessly in their cars. Software is becoming more and more important – the car a digital companion. It navigates you to the nearest free parking space, reminds you of workshop appointments, recommends restaurants in the vicinity and plays your favorite playlist. It is not only infotainment functions but also vehicle systems such as the brakes or the battery that can be updated over the air, reducing the number of workshop visits. Even traditional sales and distribution channels are changing. Direct customer contact may be limited in the future but that makes online selling even more relevant.

Autonomous driving, e-mobility and new customer needs are accelerating the transition from automaker to mobility service provider. From campus networks for the smart factory and 5G for connected vehicles to digital solutions for transport and logistics, our trend book shows you just what can be done with the aid of digitization.



IoT as the Engine of Digital Transformation

Digitization Trends in the Automotive Industry: Scenarios & Use Cases

In general, the automobile industry has already made great headway in terms of automation, but to deal with the new challenges and be even readier to face the future, OEMs and suppliers must now adapt their production, optimize processes, focus even more on customer needs and manufacture more flexibly. For all of these, digitization and, especially, the Internet of Things (IoT) are the most important tools. The cloud has also become irreplaceable for the automotive industry: The more data the vehicle generates by means of sensor technology, the better use cloud services can make of their advantages such as flexible provision of resources. And, again,we need connectivity to match.

A glance at the many different trends that are transforming the automobile industry is sufficient to show that digitization and the IoT are the basis of many elementary use cases.

Key Figures from the Automotive Sector

By 2035 **1/3** of all journeys in German cities will be autonomous.[2]

57 % of automobile industry decision makers see potential for digitization first and foremost in production

of the **16 million new cars** in Europe in 2018 **32 %** were made in Germany.[4]

The number of traffic accidents in Germany could be reduced by **10 %** due to autonomous driving.[3] !

In June 2020 EV owners in Germany had around **24,000** publicly accessible charging points at their disposal.[5]

About 3.6 Mio. cars were newly registered in Germany in 2019.[6]

Connected Car

The Smartphone as a constant companion is increasingly influencing our immediate surroundings. At home, lighting and heating respond to instructions from an app, WiFi connects with the Internet, and a Bluetooth speaker takes over the playlist from your cellphone. And we expect the same service from our cars. As a mobile part of the Internet of Things, its built-in SIM card (eSIM) provides in-car WiFi. The infotainment system plays music from the smartphone and Google Maps determines the route. It must all function smoothly without media discontinuities. No wonder modern vehicles are jam-packed with software! And this software, like the operating system and the apps, is updated over the air.

Manufacturers want to offer their customers the same user experience to which they are accustomed from their mobile devices. BMW is very much abreast of the trend. It, along with other automakers such as Audi or VW, has integrated digital language assistants such as Amazon's Alexa into its Connected-Drive service. "Hello BMW" informs the driver about the weather conditions on their journey and about their next workshop appointment or how much gas they still have in the tank. With the latest update, delivered over the air of course, BMW is providing its customers with a new map service. The update integrates the Apple CarPlay function even more deeply into the system in order to connect iPhones even more intuitively with the vehicle, including Apple's virtual assistant Siri. In contrast, Renault-Nissan-Mitsubishi is relying from 2021 on Google's Android as its infotainment service operating system.

Control for OEMs, Experience for In-Car Users

For OEMs, customers' increased desire for wide-ranging in-car entertainment means that they must also manage private in-vehicle data use. For this purpose a central management platform provides them with an overview of all eSIMs in their vehicle fleet and total cost control. The more data-intensive the usage, such as for 4K video streaming or gaming, the faster the data volume is exhausted. If the mobile network provider offers differentiation of data usage (a traffic split), the costs can be split too. OEMs could then charge third-party providers of, say Netflix or Spotify streams for the in-vehicle provision of these services. For the customers nothing changes. They simply register their car's entertainment system like any other device in their account and thereby benefit from an end-to-end user experience.

Rethinking the Drive

E-Mobility

Classical automakers were not the drivers of electromobility. Statutory regulations on CO_2 vehicle emissions, the successes of competitors such as Tesla, and a steep decline in public and political acceptance of combustion engines are forcing the industry to rethink. According to Roland Berger's Automotive Disruption Radar one in four German car owners is considering buying an EV, or battery-powered car. In China, the most important sales market for German manufacturers, the corresponding figure is two out of three. Customers want to be mobile but also sustainable. The snag is that the number of EV models can only grow in line with their mileage range and the number of charging points. Chargemap lists a good 20,000 public charging points with nearly 70,000 connections. The Federal Ministry of Economics and Technology (BMWI) puts the number at 234,000. So automakers and charging point providers – mostly public and commercial utilities – blame each other. According to the energy industry association (BDEW) two out of three Germans would in any case prefer to charge their EVs at home overnight.

IoT Assists Providers and Consumers

Consistency is also in short supply. Public, semi-public and private charging points are unevenly distributed in town and country and from state to state. Consumption too is unevenly distributed round the clock. Supply and demand must be coordinated. The Internet of Things can here assist both the e-mobility industry and EV users. Once the charging infrastructure is integrated into the IoT network, charging points can be joined up with a smart parking concept, for example. Users see in their app which free parking space has a charging point, whether it supports a quick charge and how much it charges per kilowatt-hour. The in-car navigation system could also support this function. Charging point operators would receive usage data in real time and be able to optimize their offering. An IoT platform on which all data – feed-in and consumption – converges could help prevent load peaks.

Shared Mobility

Carsharing on the Rise

Is the automobile still the Germans' favorite child? They still like driving but owning a car is clearly not as important as it used to be. According to an Allensbach opinion poll an estimated nine million Germans are interested in carsharing. The Bundesverband Carsharing says there are already 2.3 million car sharers in Germany. BMW and Daimler have merged their carsharing services and their ShareNow service is the market leader. The different business models (see Glossary) have one thing in common: Vehicles and drivers are connected via an app. In much the same way as the digital search for free charging points or parking spaces, users find connected cars – and book, unlock and pay for them – via the app.

One App For All Cases

Carsharing Glossary

- Carsharing = Car hire for a short time and a short distance. Finding a car, booking it, hiring it, unlocking it, locking it and paying for it are all done via an app. Use is charged by mile and/or minute. Models are either station-based (the car is located at and must be returned to its base) or free-floating (I can leave the car anywhere).
- Ridehailing = I use the app to hail a ride. The app shows the driver's position and estimated time of arrival in real time.
- Ridepooling = Several customers heading the same direction share a booked car. An algorithm determines the route.
- Ridesharing = A car pool using private cars.

Smart parking pursues several goals simultaneously: show the irritated motorist the shortest route to a free parking space in the city, counteract the negative effects of looking for somewhere to park downtown (congestion, emissions, noise, particulate) and enable cities and enterprises to manage parking spaces more efficiently. IoT is the key to success. Optical sensors on building walls, street lighting or traffic light posts or sensors embedded in the ground identify free parking spaces and relay their location to the Cloud, using the energy-saving IoT mobile communication standard NB-IoT. Apps like Telekom's Park and Joy show drivers in real time free parking spaces near their destination and navigate them there. Payment is, again, by app.

Car Scenario of the Future

Autonomous Driving

Before the crisis, autonomous driving was the subject of hype that has since subsided to some extent. Yet even though it may be decades before Level 5 autonomous cars (see description below) populate our roads, automakers cannot afford to wait and see unless they are willing to let high-tech Silicon Valley enterprises outpace them. Waymo, a subsidiary of Google parent company Alphabet, is already testing an entire fleet of robot taxis in Arizona. The EV pioneer Tesla and the taxi services Uber and Lyft are also very much involved in the automotive scenario of the future. Traditional OEMs are cooperating with each other or with technology enterprises to achieve synergy effects. General Motors and Honda have jointly designed Origin, Volkswagen and Ford are investing in a startup, Argo AI, BMW is collaborating with Fiat-Chrysler and Audi is cooperating with Huawei. Daimler has just joined forces with Waymo to develop autonomous trucks.

Five Steps to Autonomous Driving

Level 1 **Assisted Driving**
Tempomat, automatic distance control

Level 2 **Partly Automated Driving**
Keeping in lane, semi-automatic parking

Level 3 **Highly Automated Driving**
Overetaking, braking, accelerating

Level 4 **Fully Automated Driving**
Driver intervenes only in case of system failure

Level 5 **Autonomous Driving**
Driver is no longer needed

Networking Around the Car

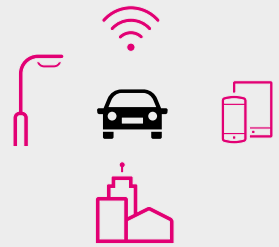
Autonomous Driving in the Smart City

The concepts differ, but in one respect they are identical: autonomous vehicles must communicate continuously with their surroundings (V2X, see box). The traffic situation is highly complex, especially in the city. In the future the car will be connected with other vehicles, cyclists and pedestrians, traffic lights and road signs, construction sites and road limits. The reliable, comprehensive and instantaneous communication that is required has only been available with the new 5G mobile communication standard.

With data rates of up to ten gigabits per second and a latency of one millisecond, 5G ensures that autonomous vehicles can react swiftly enough in confusing and unforeseen situations. What is more, 5G supplies up to a million connections per square kilometer with reliable mobile network connectivity, which is indispensable in urban canyons. That is the only way in which the Internet of Things can support autonomous driving in the smart city with sensor technology and edge computing. And to ensure that the car stays exactly in lane, Precise Positioning uses GPS and mobile network data and a smart correction algorithm from the Cloud to provide vehicle positioning that is exact to the centimeter.

Vehicle Communication Categories

- **V2X** = Vehicle-to-Everything
- **V2I** = Vehicle-to-Infrastructure
- **V2V** = Vehicle-to-Vehicle
- **V2N** = Vehicle-to-Network
- **V2D** = Vehicle-to-Device
- **V2M** = Vehicle-to-Motorcycle
- **V2P** = Vehicle-to-Pedestrian



Smart Factory

If assembly lines and machines grind to a halt at an OEM, the damage can quickly run into millions. To prevent outages, the Internet of Things facilitates predictive maintenance by means of sensor technology and artificial intelligence. Predictive maintenance does even more. It analyzes the quality of production and identifies weak points on the basis of previous service occurrences. Artificial intelligence makes predictions even more precise, continuously evaluating machine, sensor and service data on an IoT platform.

IoT for Faster Intervention

A medium-sized mechanical engineering company that produces complex, special-purpose machines for large automobile manufacturers has equipped its plants with sensors. Their analytics, such as temperature, wear, pressure or humidity data, are processed on site using edge computing and then sent to a Telekom IoT platform. All data is presented visually on a web dashboard. If a threshold value is exceeded, the system notifies the maintenance team. A swift response by the technicians forestalls machine outages. Maintenance can be planned better too.

Predictive Maintenance

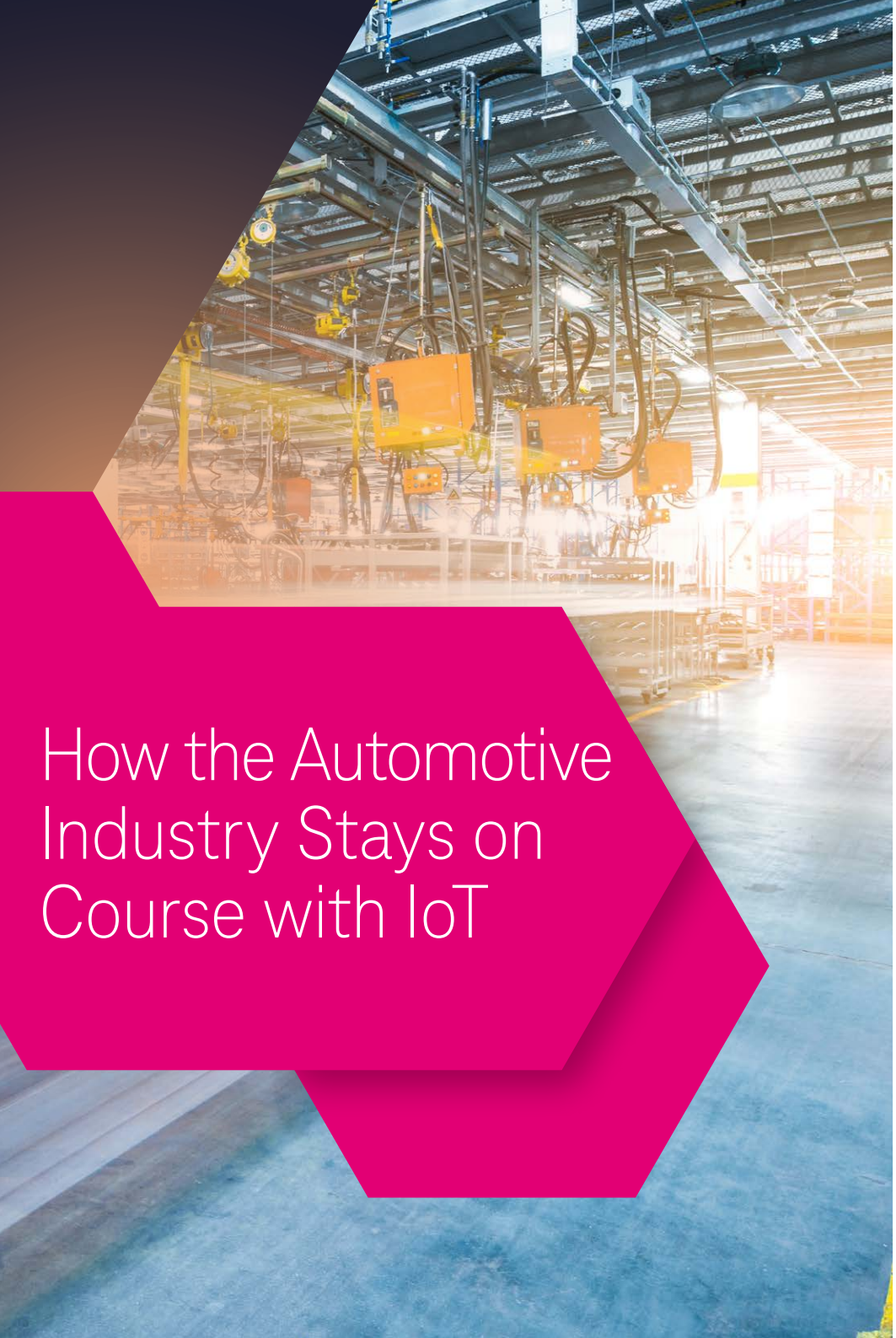
Faster with Edge Computing

Campus Networks for Mobile Applications in Production

Along with the rigid infrastructure of plant and machinery communicating via fixed-line connections, more and more mobile applications are performing important tasks on the production floor. Augmented reality-assisted remote maintenance, driverless transportation systems or using drones to take an inventory requires a reliable, highly available, powerful and instantaneous wireless connection. Campus networks meet these requirements. They supply production halls, vehicles and plant within a specified area with a reliable 4G or 5G connection. Combining a private and a public network provides, firstly, secure network resources reserved for the company and, secondly, enhanced local network access for employees, external service providers and suppliers. The private part of the campus network is reserved solely for critical machine communication, is not publicly accessible and is available exclusively for the location. A licensed range and managed network resources ensure high reliability. On-site data processing by edge computing ensures low latencies. Service level agreements ensure availability.

Advantages of Predictive Maintenance in Production

- Outages are prevented and machine availability – and with it productivity – is increased.
- Data evaluation brings transparency into production processes.
- Weak point analysis improves quality.
- Service technicians must only be called out when needed, which cuts costs.
- Timely completion means a better adherence to delivery dates.



How the Automotive Industry Stays on Course with IoT

Transport & Logistics

The effects of the Covid-19 pandemic have shown that many global supply chains are vulnerable. At the outset of the crisis, companies were especially hard hit when several factors coincided, such as employees in quarantine, a slump in both demand and supply, and closed borders. Automobile manufacturers were forced to shut down production facilities for a while, which affected suppliers too. The big problem that also affected other manufacturing companies was that global supply chains ground to a halt.

IoT Brings Transparency into the Supply Chain

Just like a medium-sized consulting firm that specializes in crisis and recovery management, among other things. In one of their last projects, this meant getting the idle supply chain of an automotive supplier back on track. For transport monitoring, the company uses tracking modules that regularly send their position to an IoT platform. The manufacturer can track locations via a web portal and then adjust its production to meet delivery windows to the minute. This saves time, reduces downtime and makes the supply chain resilient.

Digital Supply Chain

IoT Brings Order into Logistics

Few machines are as complex as a modern automobile. Prior to final assembly, logistics is a decisive factor. An automaker must coordinate around 1,000 suppliers that ship deliveries to his factory at an average rate of 1,200 trucks per week. When the components arrive and exactly where they are is crucially important for the assembly line. The automaker has digitized all components and connected them with an IoT platform. All the information required for the manufacture of 2,300 vehicles a day from around 16 million individual parts now converges on a video screen at the logistics center. The digital supply chain with its underlying IoT solution supplies all this data in real time. Delivery parts lists and their current location can be seen at any time. Real-time information about them reduces the production time considerably.

Digital Label Instead of Paper Sticker

Paper labels, which have to be manually stuck onto transport boxes or pallets and regularly changed, can be replaced by a digital label. The display of the IoT devices shows all relevant product information. If the pallet crosses a geofence around a warehouse, the information changes automatically. For example, the forklift driver can see which production hall to deliver to. The label also reports vibrations – and thus prevents damaged parts from entering production.

Everything From One Source

Telekom IoT Solutions for the Automobile Industry

Deutsche Telekom IoT orchestrates all tools around digital trends in the automotive industry and assists you with your digitization projects. From us you receive all solutions from a single source:

Connectivity

We deliver for every use case the optimal networking solution made to measure for your company: eSIM profiles, a management platform for all your vehicle fleet's M2M SIM cards, in-car WiFi, APNs for B2B and B2C data streams, traffic splitting, 5G for campus networks and intralogistics, NB-IoT for your Smart Factory, and, of course, cross-border roaming.

Strong Partner Network

Our 600-plus roaming partners enable global connectivity for your vehicle fleet. And in our IoT ecosystem of certified hardware and software partners you will always find the right solution: a one-stop shop for the Internet of Things.

All-round Security

We set the highest standards and provide security "Made in Germany." GDPR-compliant data security and data protection with highly available high-security data centers in Germany. In addition you benefit from longstanding automotive security expertise: from the Automotive Security Operation Center (SOC), the cyber defense center against car hackers, via automotive penetration testing for the connected car to the Intrusion Detection System (IDS) for surveillance of in-car networks.

Expertise & Consulting

You can trust our experts. They have years of experience on all digital aspects of new technologies, connectivity and device management, integration and Cloud ecosystenms, security and analytics.

Collected Knowledge Around the Car

Our Automotive White Papers for Free Download:

- The Software Defined Car: Developments in In-Car Software
- OverThe-Air-Updates: Online Services for Automobiles
- Cyber Security for Connected Cars
- Smart Engineering with Big Data and Digital Twins
- PAC Study: The Future of Mobility
- Factsheet: Precise Positioning

M2M Pioneer for the Connected Car: Telekom was in 2004 the first provider to launch an M2M service for the automotive industry. In 2020 around 12 million cars are equipped with a Telekom SIM card. By 2025 there will be 25 million.

Would You Like to Learn More?

Are you looking for connected car solutions? Would you like to achieve transparency in your supply chain? Do you want to digitize your production processes? Contact us – with no obligation – and let us jointly draw up a solution that is a perfect match for your business case!

List of Sources:

[1] https://falkensteg.com/toxic-triple-erfordert-umfassende-neuausrichtung-der-automobilzulieferer/
[2] https://www2.deloitte.com/de/de/pages/trends/urbane-mobilitaet-autonomes-fahren-2035.html
[3] https://www.dihk.de/de/themen-und-positionen/wirtschaftspolitik/verkehr/studie-autonomes-fahren-3918
[4] https://www.bmwi.de/Redaktion/DE/Publikationen/Studien/automobile-wertschoepfung-2030–2050-zusatzauftrag.html
[5] https://www.bmwi.de/Redaktion/DE/Dossier/elektromobilitaet.html
[6] https://www.acea.be/press-releases/article/passenger-car-registrations-1.2-in-2019–21.7-in-december

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