

WHITEPAPER

Highly automated driving & ADAS

Driving autonomy to the next level



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About Expleo

Expleo is a trusted partner for end-to-end, integrated engineering, quality services and management consulting for digital transformation. We help businesses harness unrelenting technological change to successfully deliver innovations that will help them gain a competitive advantage and improve the everyday lives of people around the globe. We operate in 30 countries.

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There is broad consensus in the automotive industry that Level 5 autonomous driving – full automation with zero human activity or attention in a public setting – is still a good 10 years away. Level 4 autonomy in controlled environments, such as dedicated taxi lanes, car parks or airports, are much closer, as they don't have the same infrastructure and public liability constraints.



At Expleo, our vision for this new era in mobility is based around four questions:

How can we move more safely?

Keeping passengers and the public safe is make or break for full automation.



How can we move more respectfully for the planet?

Reducing carbon emissions is the challenge of our age. The transportation sector must use all the tools at our disposal to prevail. The autonomous revolution must be green too.



How can we move more efficiently?

Most cars sit idle for 95% of their life, which is simply inefficient. The answer is therefore fewer cars, moving more often. What role do autonomous vehicles play in an ownerless future?



How can we move more affordably?

The component parts of autonomous and electric vehicles, such as sensors, radars and lidars, are prohibitively expensive. Innovation is needed to democratise mobility.



We have identified 5 truths that will drive autonomy to the next level over the next 10-15 years.

Truth #1 Simulate for 10,000 years of operation

[Although road fatalities are decreasing, there are still 40,000 road deaths in Europe every year¹](#). More than 90 percent of road traffic accidents are caused by human error, such as speeding, misjudgement, impairment or distraction. In theory, full automation of the vehicle will remove the human element and so result in a reduction in incidents.

However, robots are certainly not perfect. Accidents will still happen in hazardous conditions and AVs must interact with the public within an uncontrolled environment. Cybersecurity (see below) also brings a new risk. Logging the necessary number of test miles within a live setting is a considerable challenge. The bar is incredibly high for an acceptable rate of failure – [currently one accident in 10,000 years of operation²](#). Even inside a restricted-access car park, the failure rate is once in 1,000 years.

In other words, it's impossible to test at that limit without advanced simulation. The infrastructure and connection to the network must be validated to an incredibly high level, across all kinds of topologies and scenarios. There are a vast number of different interfaces and interactions that also need to be tested, expanding the scope of players that need to work together – such as cloud, network and security providers. The organisational complexity adds to the technical complexity.

At Expleo, we have enjoyed tremendous progress in recent years on simulation for new mobility. We have one of the few open-source freeware global simulation solutions available on the market. By global, we mean the capacity to simulate the car and how it behaves in a wide range of environments, including fog, high winds,

slippery roads etc. It also includes all the other layers of autonomous navigation: wireless communication, traffic and energy levels.

At the moment, there are no off-the-shelf simulation solutions that reach the same level. As an integrator, Expleo has gathered software and algorithms to construct an end-to-end simulation that holistically validates the myriad scenarios of autonomous driving.



Truth #2 Trust in incrementality and integration



Autonomy, like many innovations, requires a step-by-step approach. You won't hit a home run in your first game! If you create an intelligent perception system that can detect dogs, that's great. Now you need to detect both dogs and prams. And you progress like that. Each deadlock and barrier requires more complex scenes and scenarios, which raises the level of security and safety higher.

One of the key challenges for OEMs is that all these leaps forward are happening in isolation across the world. The global technology race includes thousands of start-ups and SMEs across France, Germany and the UK alone. Of course, the US, China and India are chasing the answers too. Big automotive firms are therefore buying up and collaborating with SMEs to increase their technological depth and intellectual property, as they lack the in-house agility to develop new services themselves.

Integration of all these innovations is the next hurdle to progress. How to bring advances in technology together in a way that actually works? That's where a partner like Expleo makes the difference. Our New Mobility team has worked together for four years – which is a long time, given the speed of change. We have taken those incremental steps working on specific use cases, with the goal of building hands-on experience of the latest technologies. We have dealt with the highest levels of software and algorithms.

When our consultants integrate within a client team, we know the processes. We know the methodologies for using these state-of-the-art tools. Combined with our knowledge of automotive – and innovation from other industries – we bring a rounded perspective on what works within clients' systems.



Case Study – Autonomous Valet Parking (AVP)

An in-house R&D&I project to discover and explore new applications for autonomous driving

Our aim was to create a demo car for an end-to-end service around the everyday parking experience. At the same time, we wanted to increase our expertise in leading complex technological projects across multiple countries, including all steps from system definition to application on a prototype for both embedded and cloud-based services.

Within a controlled environment like a car park, the driver, car and infrastructure need to have a coordinated and safe interaction. AVP provided a hands-on opportunity to explore cutting-edge technologies such as Deep Learning, AI, Computer Vision and Data Fusion.

Rather than create a ready-to-sell product, we set out to highlight our expertise in mastering a full-scale, technologically advanced, state-of-the-art, complex, multi technology project.

“The aim for our AVP project was to develop skills and open a shop window for what Expleo can do. We achieved that. In just one year, we went from no vehicle, no software, no parking site, no team – to one prototype vehicle, one end-to-end software stack, one test parking facility and one video showing off the whole use case. There was so much good energy in the team, with everyone determined to making the project a success. AVP demonstrated our incremental knowledge growth, building on previous in-house projects and now contributing to others.”

Moreover, some challenges such as defining the communication interface, or infrastructure requirements need to be addressed with the relevant parties (constructors and parking owners) for them to be globally accepted.

We discovered just how closely the car and infrastructure need to work together. Splitting the responsibility and intelligence between them both, based on their capacity to access the relevant data, proved more effective than leading with either. For example, the car has immediate access to its sensors; hence, it must be responsible for controlling its actuators and avoid any collisions or damages. On the other hand, the car park has the best knowledge of its environment; hence, it must be responsible for the spot assignment and the path generation.

Guillaume Hauss, Technical Project Manager

Truth (#3) Optimise infrastructure now!

The infrastructure requirements are going to prove a major obstacle for autonomous driving. This is perhaps the most underrated area of development.

We mostly know the technology that will need to be embedded in the vehicles, but to guarantee safe autonomous driving, we will need extra sensors and information within the environment.

Intelligent streetlights offer huge potential in helping driverless cars to navigate roads, both during the day and at night. However, replacing old systems with smart lighting takes time. You need permits and policies, even before the construction takes place.

Multiply that for CCTV cameras, sensors, connectivity devices, networks. And they need to work across every scenario: roundabouts, intersections, highway junctions. This 'third actor' for autonomy will take years to get right.

Infrastructure optimisation will greatly decrease the overall bill of the installation. What if 10 cameras could do the same job as 25, with no reduction in performance and safety?

This is another area of development for the Expleo team. We bring our clients up-to-date knowledge on the network and related infrastructure.



Truth (#4) Address cybersecurity in the development stage



It goes without saying that connectivity and information sharing are inseparable from autonomous driving. Accuracy of information and security of connection are therefore critical. Where does information come from? Is it reliable and safe? Who might have breached the network? The consequences of a failure or attack could prove catastrophic, and undermine confidence in a brand or the wider industry.

However, potential security constraints are often lower down the list of priorities for connected cars. At Expleo, we believe they need to be addressed in the development stage. This will not only lead to more secure systems, but also avoid the need to retrofit enhancements or even redesign from scratch, after cyber analysts run their checks.

We are developing a shift-left approach to cybersecurity that will save valuable time for manufacturers and give better protection to drivers.

Expleo can help provide the right methodology to avoid surprises down the line. This is true for Mobility-as-a-Service (MaaS) too, as cybersecurity presents a major road bump for the future. Some countries are reluctant to have private networks for different vehicles. What is the counter-argument to that? Expleo offers clients the adaptivity to model a system to a specific set of local constraints.

Truth (#5) Prepare for Autonomy-as-a-Service

While car ownership is growing in Asia and South America, the market is aging in Europe. Growth is slowing down, year on year, and expected to [enter decline by 2025³](#). [Fewer younger people are driving⁴](#) compared their parents' generation, while cities have taken positive steps to make car-free living more attractive.

We have arrived in the era of MaaS, where individuals, families or businesses pay a subscription that incorporates several complementary modes of transport.

The profit of tomorrow will therefore come from the usage of a vehicle, rather than the vehicle itself. This presents a new challenge to OEMs and Tier 1 suppliers, who are rapidly investing in the wider ecosystem of MaaS, such as software to manage fleets of vehicles or EV charging points.

The natural next step is Autonomy-as-a-Service, especially if people lose the skills or confidence to drive themselves. This evolution is already gathering pace, with the [first robo-taxis expected to go live in 2025⁵](#).

As systems experts, Expleo helps to create new mobility services, for any market in the world, by assessing the constraints, environment and likely scenarios. We guide clients on the right vehicles, architecture or software framework to gain the highest return.

We can also assist with the operations and maintenance of a service – an evolution of the product lifecycle management (PLM) we offer our clients today. Ensuring the app software and operating system remain high performant is critical for boosting the customer experience and therefore customer retention, in what will prove an extremely competitive marketplace.



About the author



GUILLAUME HAUSS

Technical Project Manager –
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Guillaume Hauss completed a master of science in robotics from a major French engineering school. He has successfully completed a 4-year experience at Expleo during which he managed several technical projects in automotive, ADAS functions and AD, for both internal R&D department and major automotive Tier 1s. He is now in charge of R&D projects operations for Expleo France.

“The most attractive aspect of working at Expleo is that we have great freedom to choose our proofs of concept, working alongside extremely knowledgeable colleagues. We have been through a lot together. Of course, Expleo is not an academic body. We’re a commercial organisation, developing solutions that will work in the real world. But to have that freedom is rare and it brings the absolute best from our team.”

Guillaume Hauss
Technical Project Manager

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Partner with Expleo for bold thinking on autonomy

At Expleo, we are committed to helping our clients in the automotive industry achieve their goals for sustainable transformation over the next decade and beyond. We may not invent the individual gadgets or entirely write the algorithms that advance ADAS, connected cars and autonomy. However, our teams have deep, practical knowledge of how this technology fits together, built through our in-house projects. We know how to think, design and integrate innovations within the vehicles of tomorrow.

Expleo brings a range of services. We have engineers who work on sensors, radars, lidars, cameras, energy storage units etc, including the necessary apparatus in house, especially in Germany, France and the UK. We can also help with model-based system design, within base testing and systems architecture.

As a global company, we share best practices from our international offices and cross-fertilise innovations from other industries such as aeronautics, defence and space. For example, an airport control tower can inspire similar architecture for connected cars or smart trains.

We now have the capacity to help any industrial player move forward autonomous mobility challenges, whether moving packages in a warehouse, passengers in airport buses or providing drone support for soldiers on the front line. If you have something that you need to move without a human driving it, then we can help you do that.



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