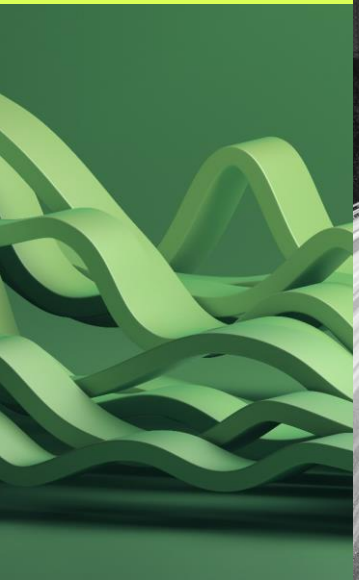
WE DEFINE
FUTURE IMPACT

TECHNOLOGY
SOFTWARE
CONSULTING

ADAS
Market Intelligence
EU / NAR / CN



BUSINESS
AS UNUSUAL

# P3 ADAS Market Insights

We analyze global OEMs regarding their ADAS capabilities across the NAR, EU, and Asian markets.

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# P3 & P3 Autonomous Mobility.

**General** Introduction

# At home in the outside world.

## Europe

| | |
|---|---|
| Germany | Stuttgart |
| | München |
| | Wolfsburg |
| | Düsseldorf |
| | Berlin |
| | Hamburg |
| | Osnabrück |
| France | Paris |
| | Toulouse |
| Denmark | Kopenhagen |
| Polen | Breslau |
| Serbia | Belgrad |
| | Subotica |
| Romania | Cluj-Napoca |
| Greece | Athen |
| Czech Republic | Prag |
| Bulgaria | Sofia |
| | Gabrovo |

## South America

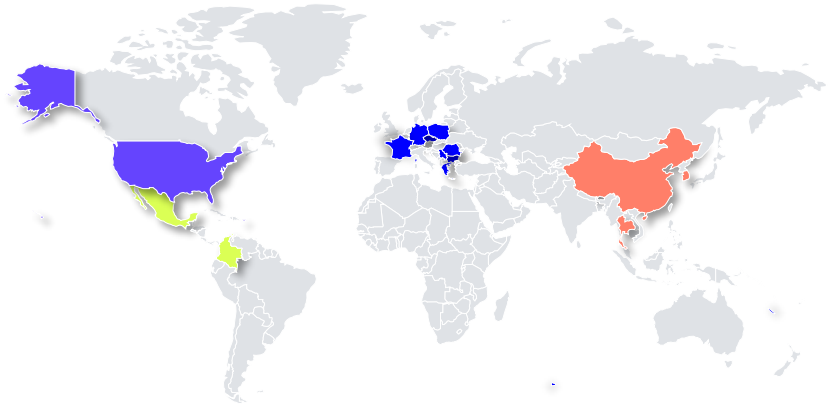
| | |
|---|---|
| Mexico | Mexico City |
| | Puebla |
| | Querétaro |
| | San Luis Potosi |
| Colombia | Cali |

## North America

| | |
|---|---|
| USA | Charleston |
| | Detroit |
| | Greenville |
| | Dallas |

## Asia

| | |
|---|---|
| China | Peking |
| | Shanghai |
| | Shenzhen |
| Korea | Seoul |
| Thailand | Bangok |



# Portfolio as unusual.

## SOFTWARE

- Android Automotive
- Business Intelligence
- Cloud Migration
- Cyber Security
- Data Analytics
- Enterprise Solutions
- Financial Systems
- IT-Architecture
- Certifications

## TECHNOLOGY

- **Autonomous Driving**
- Battery Technology
- Electric Powertrain
- Energy Solutions
- Industrialization
- Charging Infrastructure
- Operations Excellence
- Task Force Management
- Testing & Engineering

## CONSULTING

- Agile Transformation
- Artificial Intelligence
- M&A Strategy
- Marketing & Design
- Sustainability
- Project Management
- "Organizational Strategy"
- Quality & Compliance
- Systems Engineering
- UX/UI Design
- Transformation

# P3 advises leading international OEMs, suppliers, technology and insurance companies in the field of autonomous driving and autonomous mobility.

P3 AUTONOMOUS MOBILITY /AS UNUSUAL

**>9** years of international experience in autonomous driving consulting

**>100** customers worldwide and more than 300 successful AD projects

**>50** employees around the globe in the autonomous driving space

**75%** of the employees are engineers and software developers

We approach autonomous driving from many different perspectives. We understand the markets, know the players, but also have the technological know-how and the necessary software expertise.

## Market & Strategy

- Go-to-market strategy
- Global market and competitive analysis for AD MaaS, TaaS & ownership
- MaaS & TaaS business model development incl. business case & TCO
- Competence analysis, assessment of “best-fit” partners
- (SDS) partnerships models and joint venture agreements
- AD shuttle / robotaxi and ADAS in-field testing & benchmarking

## Technology & Regulation

- End-to-end architecture assessment and customization
- Cybersecurity, Functional Safety & SOTIF
- Regulation Implementation (AD SMS, SUMS & CSMS for SAE L3 & L4)
- Test Strategies & Management & Tool Confidence
- Sensor set evaluation and platform fortification strategies
- Support for Homologation (Type approval ODD and operation area)

## Operations & Scaling

- AD Program Management incl. strategic setup, operations strategy, organizational build-up, project conduction & benchmarking
- Scaled Pilots: setup and management of runup schemes for AD pilot projects
- AD Product Lifecycle Management AD Logistics Concepts - Conceptualization of market-ready TaaS products

# E2E consulting: From a holistic demand analysis to your individual tailor-made strategy - we are the right partner for your challenges in the field of ADAS.

## 360° **Demand Analysis**

In a first step, we jointly analyze and define your status quo, pain points and needs and sketch your future positioning and target picture in the ADAS ecosystem or specific market.

+

## P3 **ADAS Portfolio**

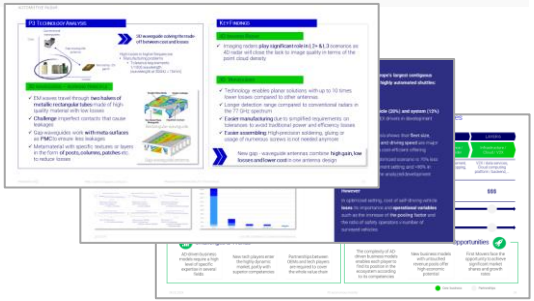
You have the needs; we have the solutions. We draw on our unique ADAS Market, Competitor, Customer, and Tech Intelligence portfolio as well as innovative software-solutions.

=

## Tailor-made **Project**

We jointly conduct your tailor-made technology or strategy project based on your capabilities and competencies and our long-term ADAS expertise.

## P3 ADAS PORTFOLIO

# We can help you with holistic AD(AS) market intelligence, tech scouting, strategic advice or operational support in technology, regulation and processes.

## Customer & Market Intelligence

- Customer & market insights
- Revenue pool analysis and forecast
- Business model analysis & evaluation
- Global, scenario-based AD(AS) market models with distinction of SAE levels incl. global market ramp-up curves
- Analysis of supply chains, value chains and ecosystems
- Business case modelling

## Go-to-Market Strategy

- Potential analysis for market entry & development of market entry strategies for ADAS
- Strategic target picture, business model & use case development (e.g., new services, products) for OEMs, Tech players, Tier 1/2s
- Elaboration of partnering / in-house strategies along the AD(AS) value chain

## AD & ADAS Benchmarking

- ADAS testing, roadshows, workshops and customer clinics
- Quality of service benchmark for AD robotaxi services (EU, USA, CN)
- AD Readiness Index (MaaS and TaaS)

## Technical Project Management & Regulation

- Ensuring product and technology readiness by installing task force leads and strengthen the organization in meeting milestones by an agile/hybrid task force approach
- Analysis of the relevant ADAS regulations in the lead markets US, Europe and CN
- Set-up of an overall regulation framework for product and process compliance

## Commercial / Tech Due Diligence

- Tech-driven analysis of market- & value-pool size (TAM, SAM, SOM) and market positioning
- Competitive landscape & customer analysis
- Review of the company's products / services, structure, staff and business plan
- Analysis of sales and marketing structures

## Technology Roadmaps

- Hardware & sensor roadmaps for L2-L5 ADAS vehicle databases
- Sensor technology analysis & V2X consulting
- Design and enablement for systems engineering in AD organizations
- Process implementation from need analysis, ConOps via requirements engineering & architecture to verification and validation

# P3 Autonomous Mobility.

## What’s new?

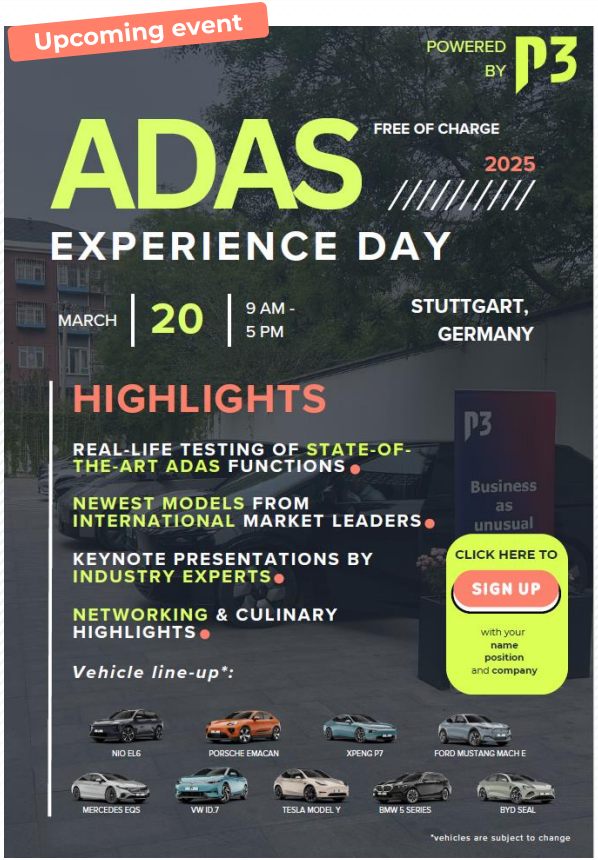
# We are continuously conducting ADAS benchmarks worldwide.




**P3 ADAS Benchmark Events**

We test OEMs' ADAS capabilities using a **standardized methodology** combining **on-road testing** and **in-depth tech evaluations**. We engage with customers through **events and roadshows** featuring live demos, allowing us to efficiently analyze performance, UX, and the tech stack.

# ADAS Benchmark Europe 2025 & ADAS Experience Day




We are excited to invite you to a unique experience:
the **P3 ADAS Experience Day** on **March 20th** in **Stuttgart**.

This exclusive event offers you the opportunity to personally **test drive the latest vehicles** equipped with cutting-edge ADAS technologies. Experience innovation firsthand with cars from leading manufacturers.

In addition to test drives, the day will feature **inspiring keynote presentations** from industry experts, **delicious food**, and **excellent networking opportunities** with fellow professionals in the autonomous mobility sector.

Beyond personal experience, the **quality of service** of the different ADAS systems for the end-user **under real-life road conditions** will be **objectively rated by independent experts**, based on the unique **P3 framework with 100+ test cases.**

Even if you cannot participate, we offer the **results in a comprehensive report**, including highlights, lowlights and additional information around the tested systems and background information regarding their performance.

**Please inquire with us for more information regarding our ADAS benchmark report**!

**Click here to register for the FREE event**

# PAVE Europe: White Paper Publication


# NEW WHITEPAPER!

As autonomous vehicle technology advances, critical factors influence public trust and acceptance of AVs.
Being a proud **PAVE Europe member and leader or Working Group 1** (Understanding, Trust and Acceptance), we had the pleasure to be part of this webinar.

The discussion aimed to **demystify AV technologies**, **confront public concerns**, and **highlight the challenges and opportunitie**s on the road to widespread adoption.
The webinar considered **real-world case studies**, **regulatory frameworks**, **public perceptions**, and the **social implications of AVs**, ultimately providing an understanding of the journey toward building trust in autonomous mobility.

Additionally, this **webinar offers an outlook on the first whitepaper created by the working group**, aimed at the general public, which will be published soon.

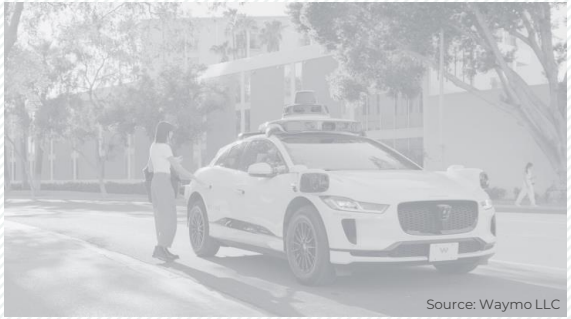
**Click here to watch the webinar**

**Click here to learn more about PAVE Europe**

# P3 Understanding of ADAS.

# While the AD revolution is still waiting for major breakthroughs, short term focus shifts to ADAS & supporting technologies.

**Proof of Competence achieved for Robotaxi (Level 4) but not yet profitable**


Source: Waymo LLC

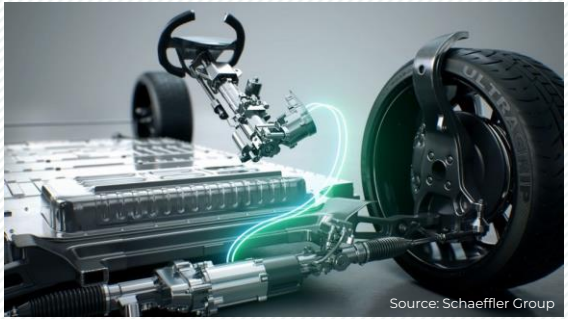
**No scalability and profitability of AD L4 MaaS soon**

**New ADAS functions (Level 2+ hands-free) will deliver real customer value**


Source: BMW Group

**ADAS L2+ / L3 will grow strong and gain higher penetration**

**AD / ADAS function will power development of new technologies** (Steer by wire, new HMIs etc.)


Source: Schaeffler Group

**Technology Ecosystem is emerging along the ADAS value chain**

**FOCUS**

# Technical differentiation for different automation levels

**CHALLENGES**
- Homologation & certification
- Quality of service
- Safety & reliability issues

Overview of automation levels

Focus

Main responsibility switches to system

| | Driver 1 | Driver 2 | Driver 2+ | OEM 3 | OEM 4 | OEM 5 |
|---|---|---|---|---|---|---|
| **Automation Level** | Driver Assistance<br>**Hands on<br>Eyes on** | Partial Automation<br>**Hands temp. off<br>Eyes on** | *Not an official SAE Level*<br>Partial Automation<br>**Hands temp. off<br>Eyes on** | Cond. Automation<br>**Hands off<br>Eyes off** | High Automation<br>**Hands off<br>Mind off** | Full Automation<br>**Driver off** |
| **Definition of assistance level**<br>*Based on SAE & adapted by P3* | **Longitudinal or lateral guidance**<br>• One-dimensional assistance<br>• Full responsibility at driver | **Longitudinal and lateral guidance**<br>• Discontinuous two-dimensional assistance<br>• Full responsibility at driver | **Longitudinal and lateral guidance**<br>• Hands free driving in suitable conditions<br>• Driver must always monitor surroundings and be ready to intervene | **Longitudinal and Lateral control by function**<br>• System handle driving tasks under specific conditions<br>• Driver must be ready to take control when needed.<br>• Driver allowed to focus on side activities | **Full control by system in limited ODD**<br>• System performing all driving tasks in specific ODD<br>• Passenger aren't required to monitor the vehicle and don't need to take control | **Full control by system everywhere**<br>• System performing all driving tasks under all roadway and environmental conditions<br>• No Driver needed |
| **Exemplary functions** |  <br>**ACC** |  <br>**LKA and ACC** |  <br>**Tesla Autopilot** |  <br>**Highway Pilot/ Traffic Jam Pilot** |  <br>**City Pilot L4, Parking Pilot L4** |  <br>**Self-driving Mobility Services** |

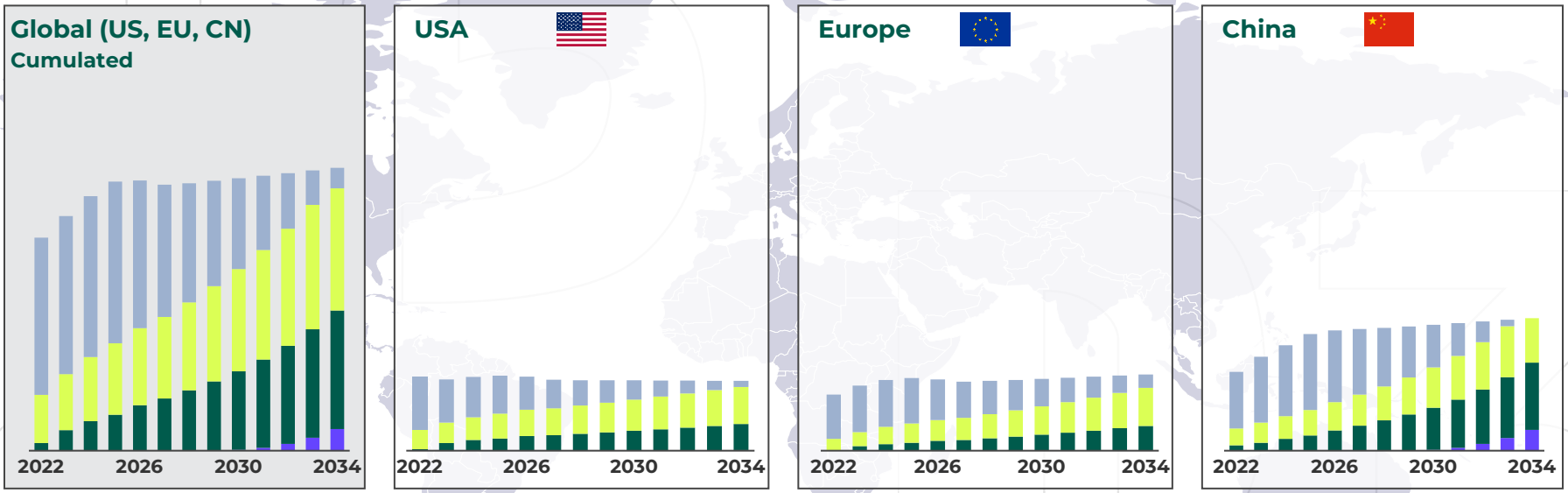
*ACC = Automated cruise control, LKA = Lane keeping assist, ODD = Operational Design Domain*

Exemplary P3 market model base case – numbers upon request

# ADAS becomes standard, while large-scale L3 is not yet in sight. Yet, the fast-growing ADAS market provides opportunities to be taken.

Level 1 | Level 2+ | Level 2 | Level 3

***TOTAL SOLD PASSENGER VEHICLE NUMBERS PER SAE LEVEL**** *[units per annum, without considering SAE-Level 0, Level 4/5 share]***



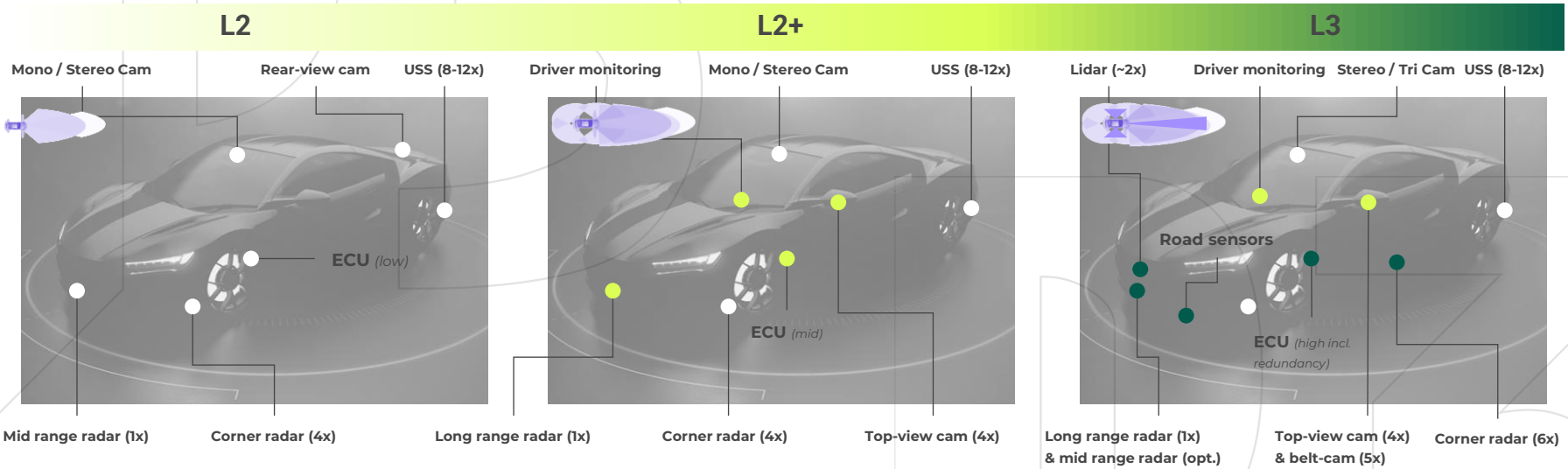

- **Scenario-based modelling with the P3 market model** allows to explore different diffusion patterns based on chosen assumption set.
- **Virtually every vehicle will be automized by 2030** – higher automation levels are on the rise, but L3+ yet lacks attractive price-performance ratio.
- **Chinese market expected to have faster diffusion of higher SAE levels.** ADAS functionalities as differentiating factor in vehicle purchase.

* Number of sold passenger vehicles on request
** Unit sales based on statista data. Diffusion patterns of SAE level based on P3 market model

Exemplary

# Increasing automation levels and new functions require a multitude of new hardware components and software.

## Related HW setup

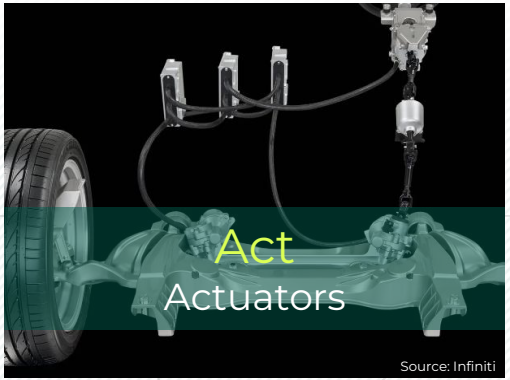



The challenge for OEMs lies in **balancing the increased costs** associated with the advanced hardware required for higher autonomy while ensuring **pricing stays attractive to end-users** and justifies the **added customer value.**

○ Components for L2 ● Additional components for L2+ ● Additional components for L3

# Developments and technology trends happen across whole sense-plan-act framework which P3 monitors closely






| Radars | Lidars | Cameras | ECU | SoC | Steer by wire | Brake by wire |
|---|---|---|---|---|---|---|

**Market development hypothesis**

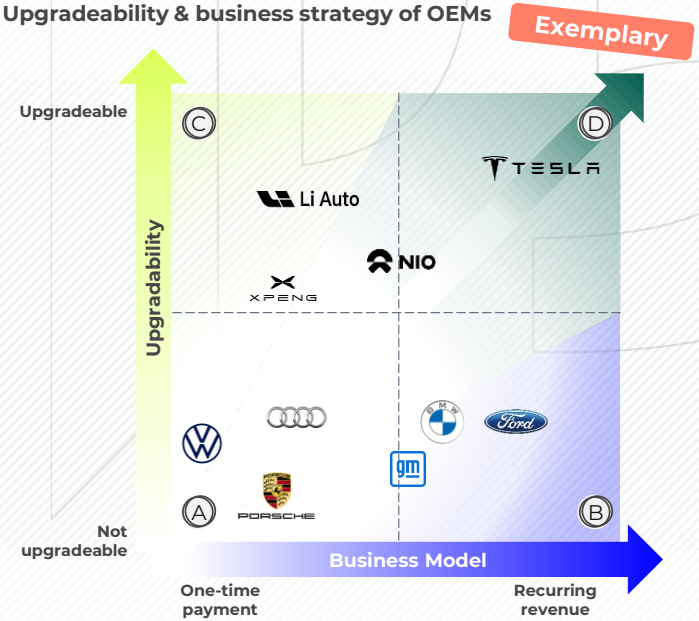
- **Camera**: **Strong growth expected** due to automation. Product will be highly commoditized
- **Radar**: **4D radars**, combined with cameras, will be the leading sensor modality for all <SAE L3 applications.
- **LiDAR**: The advancements in imaging radar performance, **need for LiDAR being reassessed** by industry players.

- Intelligence moves from sensor towards centralized high-performance **ECUs**.
- **Reliable functions required** for higher automation levels that is mostly achieved through **redundancy**.
- AI-driven development and training methods for SDS SW require high performance **SoC and ECU**.

- European OEMs will **not implement Brake-by-Wire/ (front-axle) Steer-by-Wire within the next 5 years**.
- Brake-by-Wire technology is **not pushed** by European TIER-1 nor OEMs.
- Steer-by-wire technology **reduces the mechanical complexity** in back wheel steering leading to more widespread adoption.

# ADAS is increasingly seen as a differentiating factor that is gaining in importance and, depending on the approach, will also enable new business models.

**Upgradeability & business strategy of OEMs**




**A Classic package approach**

- Currently still predominant strategy for ADAS functions
- One-time purchase of ADAS functions with unlimited access for customer leads to direct one-time revenue
- Generally higher portfolio variation & complexity due to specific HW/SW sets for cost optimization

**B Function subscriptions approach**

- Initial purchase in combination with subscription based-model after defined use time or subscription only model leads to recurring revenue for OEMs
- Potential increased initial cost for OEMs to equip vehicles with necessary hardware for later function activation, but reduced portfolio complexity

**C Upgradeable package approach**

- Extensive hardware setup, enabling future upgrades in functionalities and automation levels Potential for future revenue by already sold vehicle by software w/o further hardware investment

**D SW-driven upgrade & subscriptions approach**

- Future-proof hardware setup enabling future upgrades through software in combination with on-demand subscription model enables recurring revenue and future one-time purchases with already sold vehicles without hardware adaption

The first players are already working on providing lasting **customer value and brand differentiation through ADAS**. This is both a challenge and an opportunity that requires a considered approach on the **business model and technology side** (upgradeability).

# P3 Approach.

# P3 Approach & Methodology

Focus on ADAS Driving Functions

| Steps of P3 Approach | Guiding Questions |
|---|---|
| 1 Analysis and benchmark of the ADAS function portfolio from different OEM | Which ADAS function packages does the OEM offer? What ADAS functions do the function packages include? |
| 2 Baselining ADAS function portfolios of OEM in the main markets EU, China and USA | Which of the ADAS functions are similarly offered by several OEM? |
| 3 Clustering of the baselined ADAS functions | In which categories should the ADAS functions be clustered? |
| 4 Allocation of the functions into the ODD/operational area for each player and market | Which ADAS functions does P3 consider to be offered and ready to use in which ODD (urban, highway) in main markets? |

**Outcome: Generic ADAS function list applicable for every OEM adapted to the function portfolio and availability in the main global markets.**

Focus on ADAS Driving Functions

# P3 Definition of ADAS SAE-Level 2/2+ Function Packages (I/II)

| Area | Adaptive Cruise Control (ACC) | Lane Keeping Assist (LKA) | Lane Change Assist (LCA) |
|---|---|---|---|
| Highway | ACC maintains a constant speed and safe following distance. | LKA provides additional safety by keeping the vehicle centered in its lane, especially at higher speeds. | LCA ensures safe lane changes at high speeds by monitoring fast-approaching vehicles, warning the driver, and potentially intervening to prevent collisions. |
| Urban/ Rural | ACC handles frequent stop-and-go traffic by automatically braking and accelerating. | LKA is used for navigating tight, congested streets by preventing unintentional lane departure. | LCA helps drivers safely change lanes by monitoring blind spots and traffic, especially in heavy traffic. |

Focus on ADAS Driving Functions

# P3 Definition of ADAS SAE-Level 2/2+ Function Packages (II/II)

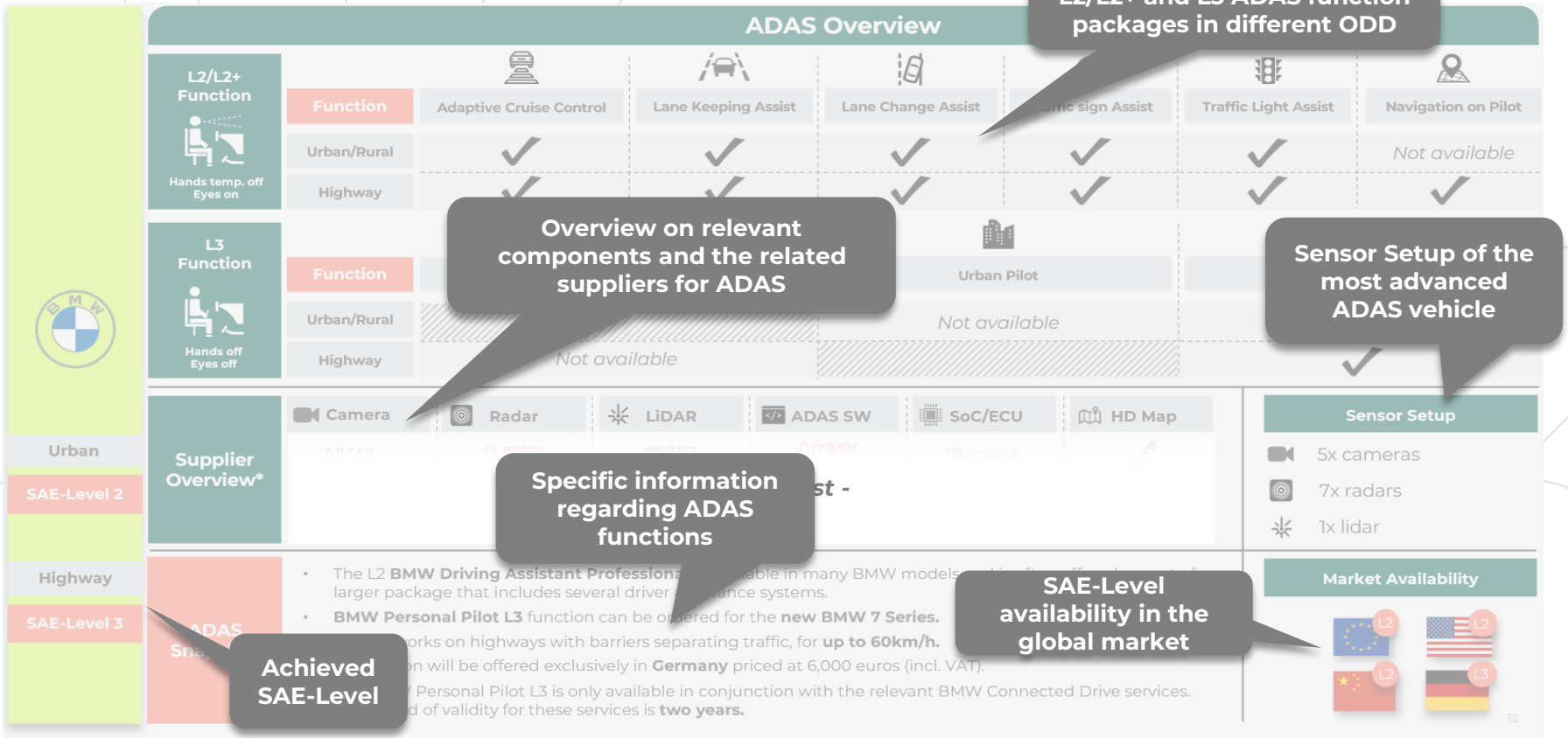
| Area | Traffic Sign Assist (TSA) | Traffic Light Assist (TLA) | Navigation on Pilot (NoP) |
|---|---|---|---|
| Highway | Recognizes and displays traffic signs, such as speed limits and regulatory signs, to improve safety and ensure compliance with traffic rules. | Traffic lights are less common on highways. However, in some countries, there are highway interchanges where traffic lights are installed. | Handles highway entry and exit ramps autonomously, ensuring smooth transition. Executes safe lane changes by monitoring traffic. |
| Urban/ Rural | Informs the driver about current speed limits, entry restrictions, and other regulatory signs. | Informs the driver about the status of traffic lights to help navigate busy intersections safely and efficiently. | Navigates complex intersections, identifies pedestrians and cyclists, manages tight spaces and heavy traffic. |

# P3 Definition of ADAS SAE-Level 3 Function Packages

Focus on ADAS Driving Functions

| | Traffic Jam Pilot | Highway Pilot | Urban Pilot |
|---|---|---|---|
| **Definition** | Autonomous driving system for congested traffic conditions at lower speeds, only on highway. It manages acceleration, braking, and steering without driver intervention. | Enables autonomous driving on highways at higher speeds, operating under certain conditions (e.g. clear road markings or moderate traffic). | Controls the vehicle in city environments, handling tasks like navigating intersections, detecting pedestrians, and obeying traffic signals. |
| **Level 2 Functions included** | • Lane Keeping Assist<br>• Adaptive Cruise Control | • Lane Change Assist<br>• Lane Keeping Assist<br>• Adaptive Cruise Control<br>• Traffic Sign Assist | • Lane Change Assist<br>• Lane Keeping Assist<br>• Adaptive Cruise Control<br>• Traffic Sign Assist<br>• Traffic Light Assist |

# ADAS One Pager Structure



# ADAS.EU Players

ADAS Status, Evaluation & Latest News

Source: BMW Group

# ADAS EU | BMW

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2

Highway

SAE-Level 3

## Overview – ADAS Driving Functions

### L2/L2+ Function

Hands temp. off
Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | *Not available* |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off
Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | ✓ |

### Supplier Overview*

Camera · Radar · LiDAR · ADAS SW · SoC/ECU · HD Map

*- Upon request -*

### Sensor Setup

6x cameras · 2x lidar
7x radars · ~2x mic.

### ADAS Snapshot

- The L2 **BMW Driving Assistant Professional** is available in many BMW models and is often offered as part of a larger package that includes several driver assistance systems.
- **BMW Personal Pilot L3** function can be ordered for the **BMW 7 Series.** L3 only works on highways with barriers separating traffic, for **up to 60km/h. Exterior microphones** are used to **detect emergency vehicles**.
- L3 function will be offered exclusively in **Germany** priced at 6,000 euros (incl. VAT).
- The BMW Personal Pilot L3 is only available in conjunction with the relevant BMW Connected Drive services. The period of validity for these services is **two years.**

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS EU | Mercedes Benz

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2

Highway

SAE-Level 3

## Overview – ADAS Driving Functions

UPDATE

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | *Not available* |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | *Not available* |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | ✓* | | ✓ |

### Supplier Overview**

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

7x cameras | 1x lidar | 5x radars | ~2x mic.

### ADAS Snapshot

- The L3 System **“DRIVE PILOT”** will be available in the U.S. market (Nevada) as an option for model year 2024 **Mercedes-Benz S-Class** and **EQS Sedan** models.
- DRIVE PILOT takes over the **dynamic driving task**, up to the speed of **95 km/h on German highways*.** Once conditions are suitable, the system indicates availability on the control buttons. Microphones are used to **detect signals from emergency vehicles**. Acoustic road moisture sensor is used to measure the sound level of the spray from the tire on wet roads, to determine impacts on the other sensors.
- The digital **HD map** provides a **three-dimensional image** of the road and the surroundings.
- L3 function will be offered exclusively in **Germany and the U.S** (Nevada and California) and is priced at **7,000 euros (incl. VAT).**

### Market Availability


* Planned for early 2025, with existing equipped vehicles eligible for a free OTA update.

** Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS EU | Volkswagen

Consideration of most advanced ADAS vehicle

## Overview – ADAS Driving Functions

UPDATE

**L2/L2+ Function** — Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | *Not available* |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | *Not available* |

**L3 Function** — Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

**Supplier Overview***

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

**Sensor Setup**

- 5x cameras
- 3x radars
- No lidar

**Market Availability**


**ADAS Snapshot**

- The **VW "Travel Assist 2.5"** can be activated via the steering wheel and is available **in ID.4, ID.5, ID.7** and the **ID.BUZZ.**
- **Adaptive Cruise Control** is active from 30 km/h, **Lane Keeping Assist** from 65 km/h, and **Lane Change Assist** can perform lane changes at speeds from 90 km/h.
- The optional **hazard warning system** can warn you of roadworks or approaching emergency vehicles.
- **The drowsiness detection and emergency assist system** automatically alerts unfocused drivers via the instrument cluster and can autonomously stop the vehicle when needed via lane change. **The emergency assist is not available yet in current VW vehicle models.**

Urban | SAE-Level 2 | Highway | SAE-Level 2+

* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS EU

## P3 Evaluation

In June 2024, BMW was the first car manufacturer to receive **approval** for the **combination of SAE Level 2 and Level 3** (usage of BMW Highway Assistant (L2) and Personal Pilot (L3) at the same time).
In our regular ADAS benchmark drives in 2024, BMW's driver assistance systems show the strongest performance among all European OEMs. In our **upcoming benchmark event**, we will **reassess the BMW ADAS system** in the P3 ADAS Benchmark Europe in March 2025.

Update

**Drive Pilot is the world's first** ADAS system to gain **type approval for a L3 system** and available in Europe and the US. However, as the system's ODD is quite limited, there is currently only small added value for customers. For early 2025 Mercedes plans **L3 Highway Pilot** up to 95 km/h after final permission in December 2024.

Update

Volkswagen's ADAS strategy is built on a combination of **internal development through Cariad** and **strategic partnerships with industry leaders** like Bosch, Horizon Robotics, Qualcomm, and Mobileye, while also **focusing on localization** for specific regions like China.

## Latest news

Here and BMW extend partnership on AI-powered mapping system.

(08.01.2025)

BMW implements vehicles leaving the factory autonomously via infrastructure-based sensors placed outside the vehicle.

(24.11.2024)

Update

Mercedes announced Momenta as ADAS supplier for four vehicle models to be launched in 2025 and 2027 in China.

(02.12.2024)

Mercedes-Benz updates automated parking assist with Parktronic to enable parking twice as fast at speeds of up to 4 km/h.

(02.12.2024)

Update

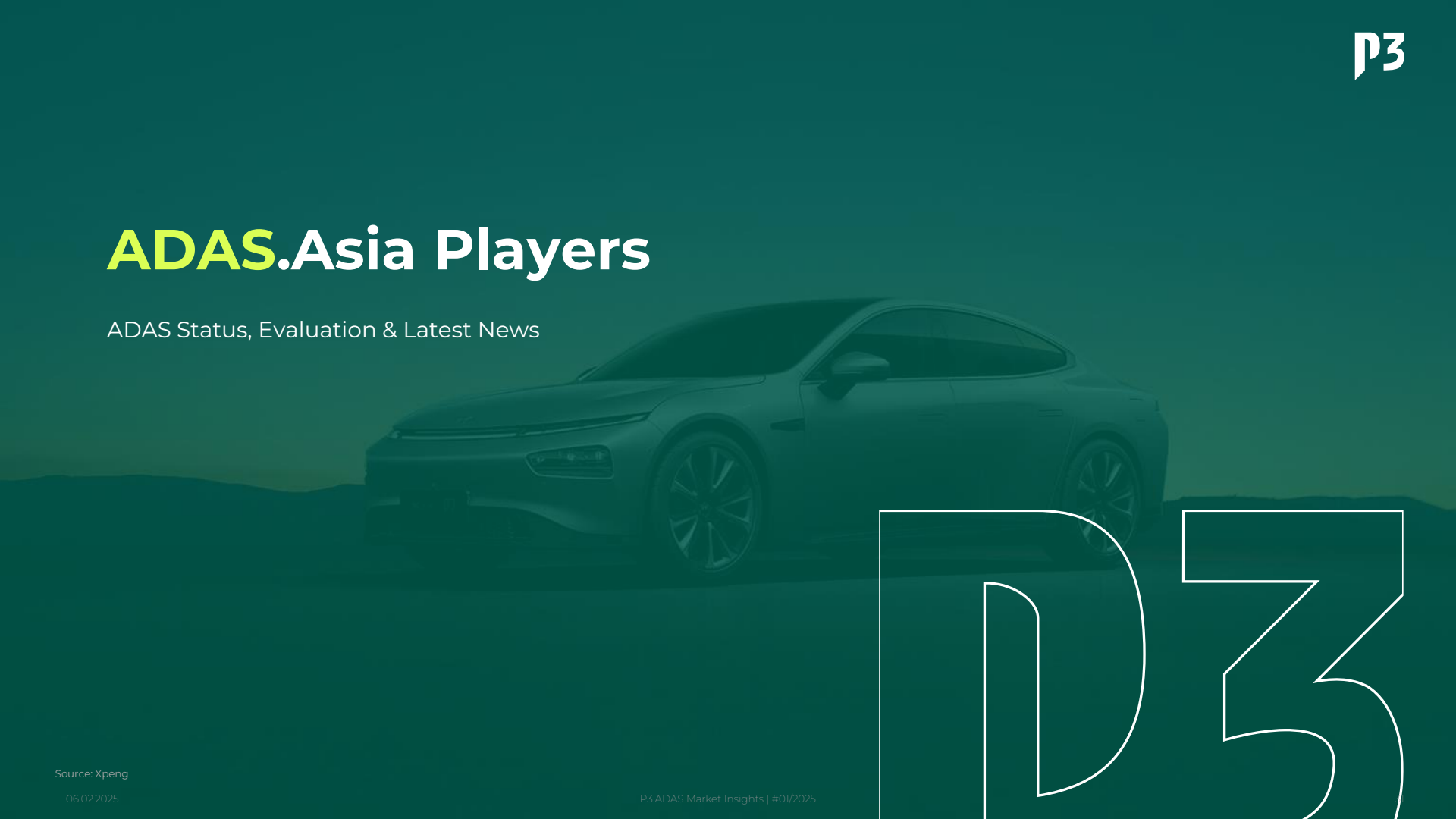
Volkswagen announced the Joint Venture with US OEM Rivian to develop electric architecture and software for next generation of Software Defined Vehicles (SDV) with impacts on ADAS development.

(12.11.2024)

Update

# ADAS.Asia Players

ADAS Status, Evaluation & Latest News



Source: Xpeng

# ADAS Asia | Xiaomi

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2+

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

- 11x cameras
- 3x radars
- 1x lidar

### ADAS Snapshot

- **Xiaomi Pilot Pro**, an in-house developed ADAS system, is available on the **Xiaomi SU7** with easy NoP activation via a steering wheel button (but limited availability in complex city situations).
- The system faces challenges with lane control, and it lacks comfort features such as **FCA distance warnings**.
- It struggles with **ACC and LKA disengagements**, along with limited recognition of traffic signs, leading to frequent interventions for lane control.
- The **ADAS stack** is estimated to cost around **€4,050.**

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS Asia | XPENG

Consideration of most advanced ADAS vehicle

XPENG

Urban

SAE-Level 2+

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

UPDATE

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

| Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map |
|---|---|---|---|---|---|
| BOSCH | Continental | robosense | XPENG | NVIDIA | 高德地图 |

*- Upon request -*

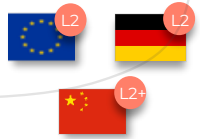
### Sensor Setup

- 11x cameras
- 5x radar
- 2x lidar

### ADAS Snapshot

- Xpeng's "**XNGP"** (Xpeng Navigation Guided Pilot) ADAS system is available on the **P5, P7, P7+, G9, G6 and X9** models, emphasizing Xpeng's proprietary AD software as a key market differentiator.
- The **ADAS stack** in these models to cost around **€4,050.**
- **The AI Valet Driving** feature in XOS 5.1.0 can memorize and customize up to **10 driving routes** of up to **100 km** each during manual driving, functioning independently of XNGP's availability.
- L2+ system includes Xpeng's **in-house developed mid-range Lidars** and a **user-friendly HMI** that supports lane change visualizations and **NoP functionalities in various driving scenarios**.

### Market Availability




* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS Asia | Li Auto

Consideration of most advanced ADAS vehicle

Li Auto

Urban

SAE-Level 2+

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

UPDATE

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

- 11x cameras
- 1x radar
- 1x lidar

### ADAS Snapshot

- **Li Auto's "AD Max" System** is available in the **L9 and Mega** models, offering strong ADAS performance, particularly in Navigation on Pilot (NoP), though its city-driving capabilities are currently limited.
- The system delivers a generally **smooth driving experience** using **ADAS hardware from well-known suppliers.**
- Through OTA 7.0 system update, performance of lane keeping functions is improved to reach zero takeovers during ADAS functions operations.
- The **ADAS stack** in these models is estimated to cost around **€4,000.**

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS Asia | Jidu Auto (Ji Yue 01)

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2+

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

NEW

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

- 11x cameras
- 5x radar
- 0x lidar

### ADAS Snapshot

- **Ji Yue 01 is an e-SUV from Jidu Auto, a JV of Baidu and Geely with ADAS System called “Robo Drive” and “Robo Drive Max” which is also available in the Ji Yue 07**, offering strong ADAS performance, though its capabilities in narrow streets and instances where the car makes full stops on wet surfaces.
- Its HMI offers **superior visualization** on a **large screen** and **outside voice control** for tasks like **opening doors**. Utilizing a **vision-only approach based on Baidu’s Apollo AD System** enhances its technological prowess.
- The **ADAS stack** in these models to cost around **€3,150.**

### Market Availability

L2+

* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS Asia | Seres (Aito M9)

Consideration of most advanced ADAS vehicle

## Overview – ADAS Driving Functions

NEW

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

Urban

SAE-Level 2+

Highway

SAE-Level 2+

### Supplier Overview*

| Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map |
|---|---|---|---|---|---|

*- Upon request -*

### Sensor Setup

- 11x cameras
- 3x radar
- 1x lidar

### ADAS Snapshot

- **Aito M9 is a Huawei powered vehicle and produced by Aito.**
- Aito M9 is powered by **Huawei ADS 2.0 ADAS** system where it **maintains good distance and position without crossing lane markings.**
- The NoP system, with its **smooth, announced maneuvers, builds high trust**. Minor issues include **occasional manual overtaking** and **aggressive lane-changing in dense traffic**.
- The **ADAS stack** in these models to cost around **€2,850.**

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS Asia

## P3 Evaluation

Xiaomi sets sight on several autonomous electric vehicle brands by **substantially investing in smart car technology**. The unveiled **Xiaomi SU7 offers great user experience at lower cost** than Western OEMs – the ADAS has still some weaknesses but is about to catch up with competition. Xiaomi successively releases **OTA updates** to increase performance

XNGP excels with a **robust ADAS and user-friendly HMI**, with drawbacks like harsh acceleration and low refresh rate for the digital rearview mirror.
In 2024, new P7+ was announced equipped with **cameras and radar sensors presumably comparable to LiDAR performance** where it seems like XPENG **removes costly LiDAR** from the ADAS sensor set.

Update

Strong performance of ADAS NOP with **high availability** (but city cases limited). The AD Max System offers a **smooth driving experience** and **utilizes ADAS hardware components from well known suppliers**. However, drawbacks include a low refresh rate for the digital rear mirror, doors unlocking on the highway, a HUD projection appearing too distant.

Ji Yue 01 excels in **NoP performance on main roads**, boasting **best availability in its class**. Vision-only approach based on Baidu's Apollo AD System and HMI with advanced visualization of system on a big screen proves the system performance.

Update

Aito M9 is the **highest-rated vehicle in its peer group**. It excels in setting the **correct speed 90% of the time and parking quickly in tight spaces**. Explainable AI through announcement of every automatically performed maneuver e.g. lane changes.

Update

## Latest news

Xiaomi SU7 to roll out urban NOA feature in ten cities.

(31.05.2024)

XPENG announces P7+ equipped with radar and camera technology, allegedly comparable to LiDAR performance.

(18.10.2024)

Update

Li Auto rolls out OTA 7.0 system update to improve performance of parking & lane keeping functions. With this update, Li Auto aims for zero takeovers during operation of ADAS functions.

(17.01.2025)

Update

Geely & Baidu JV Jiyue cuts projects due to financial troubles but denies bankruptcy.

(12.12.2024)

Update

Update from Huawei to ADS 3.0 provides significant advancements for ADAS functions.

(24.09.2024)

Update

# ADAS.NAR Players

ADAS Status, Evaluation & Latest News

Source: Tesla

# ADAS NAR | Tesla

Consideration of most advanced ADAS vehicle

TESLA

Urban

SAE-Level 2+

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

UPDATE

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Highway | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

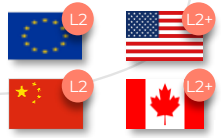
### Sensor Setup

9x cameras | 0x lidar | No radars | 1x mic.

### ADAS Snapshot

- Tesla's "**Autopilot**" which is camera-based **("Vision Only")** comes standard on every new Tesla model for the U.S and Canadian market. Additional ADAS functions are installed via **"over-the-air software updates"**.
- The **Traffic-Aware Cruise Control** matches the speed of your vehicle to that of the surrounding traffic.
- The new FSD V13 is provided via OTA software update for Tesla models **equipped with Hardware 4 (HW4/AI4)**. FSD 13.2 significantly **improves the resolution of cameras** and **exterior audio signals** are considered, so that **emergency vehicles** can be detected. Further, **park-to-park** and **reversing** significantly expand functionality.
- The one-time purchase price has been cut to **$8,000** from a high of $15,000 in 2022. Tesla also offers a monthly subscription for FSD, which was reduced to **$99 per month in the U.S.**

### Market Availability




* Based on Desk Research.
Not considering specific markets.
Non exhaustive.

# ADAS NAR | General Motors

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | Not available | Not available | Not available |
| Highway | ✓ | ✓ | ✓ | Not available | Not available | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | Not available | Not available |
| Highway | Not available | | Not available |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

- 5x cameras
- 3x radars
- No lidar

### ADAS Snapshot

- GM's **"Super Cruise"** L2+ system is **available on most Cadillac and Chevrolet models** on selected U.S. highways and can be activated by pressing a button on the steering wheel (when light bar turns green, it is available).
- When it is engaged, Super Cruise uses a **Driver Attention System** that monitors the system status and works to detect your head and eye positioning, reminding you to pay attention to the road.
- In newer versions of Super Cruise, the system can **automatically change lanes proactively** in certain situations, like when approaching slower traffic.
- In various Cadillacs, Super Cruise is a **$2,500 option or a $25 monthly subscription.**

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS NAR | Ford

Consideration of most advanced ADAS vehicle

Urban

SAE-Level 2

Highway

SAE-Level 2+

## Overview – ADAS Driving Functions

### L2/L2+ Function

Hands temp. off Eyes on

| Function | Adaptive Cruise Control | Lane Keeping Assist | Lane Change Assist | Traffic Sign Assist | Traffic Light Assist | Navigation on Pilot |
|---|---|---|---|---|---|---|
| Urban/Rural | ✓ | ✓ | ✓ | *Not available* | *Not available* | *Not available* |
| Highway | ✓ | ✓ | ✓ | ✓ | *Not available* | ✓ |

### L3 Function

Hands off Eyes off

| Function | Highway Pilot | Urban Pilot | Traffic Jam Pilot |
|---|---|---|---|
| Urban/Rural | | *Not available* | *Not available* |
| Highway | *Not available* | | *Not available* |

### Supplier Overview*

Camera | Radar | LiDAR | ADAS SW | SoC/ECU | HD Map

*- Upon request -*

### Sensor Setup

- ~ 5x cameras
- ~ 2x radars
- No lidar

### ADAS Snapshot

- Ford's **"BlueCruise"** is available to customers of **Mustang Mach-E, F-150, F-150 Lightning and Expedition** vehicles purchased in countries with designed Highways (**Blue Zones**).
- It can be used in a total of **15 European countries**, following approval by the European Commission.
- Drivers using BlueCruise in Blue Zones can drive with their **hands off the steering** wheel so long as they continue to pay attention to the road ahead.
- A **driver-facing camera** located below the instrument cluster checks the driver's eye gaze and head position.
- Ford's BlueCruise costs **$2,100 for 3 years** upfront, **or $800/year** or **$75/month** after a trial.

### Market Availability


* Based on Desk Research.
Not considering specific markets
Non exhaustive

# ADAS NAR

## P3 Evaluation


Tesla **collects a huge amount of data** and build a unique ecosystem around the fleet. While there are still legitimate discussions about the robustness of vision-only approaches, the **performance of FSD in the US is already impressive**. Nevertheless, it is still an L2+ system.
New parking functions serves to **improve the overall user experience** and **functionality** of Tesla's autonomous driving technology. It seems that it will only be available in the U.S.
With the announcement of required **update of Hardware 3 vehicles sold between 2019 and 2023 with Full-Self-Driving (FSD)** represents a **cost-intensive measure** which confirms that **Elon Musk overpromised** regarding its driver assistance system.

Update


GM is continuously developing its ADAS functionalities under the name "**Super Cruise". Employees from** its former & stopped AD L4 subsidiary **Cruise are integrated** into their parent **development organization** to further push ADAS development**.** Also, in **China, GM has invested in Momenta**.

Update


Ford said **to focus on developing differentiated L2+ and L3 applications** for privately used cars. By 2023, Ford established Latitude to develop future automated driving technology.

## Latest **news**

Elon Musk announced that Tesla's equipped with Hardware 3 (older version of computer) will need an update to support unsupervised self-driving software.

(30.01.2025)

Tesla shows self-driving capability from the factory to the designated loading dock lanes at the Fremont Factory, CA.

(30.01.2025)

Update

New Tesla Model Y Juniper has a front bumper camera to improve the field of view.

(24.01.2025)

Tesla released the new parking function "Actually Smart Summon" (ASS) where the driver calls the vehicle to them in a parking lot or driveway using the Tesla app.

(03.09.2024)

Update

Cruise's robotaxi service will shut down and cuts 1,000 jobs as GM pulls its funding and integrates AD/ADAS development inhouse.

(10.12.2024/04.02.2025)

Update

Ford BlueCruise hands-free driving technology approved for customers to use across the highways of Europe.

(31.07.2024)

# Further ADAS-related News.

# Further ADAS-related news

## Latest news


Toyota, Aurora and Continental to use Nvidia's platform for AV development. The companies will use NVIDIA's best performance Drive AGX Orin platform for their ADAS and AD systems.

#Partnership

(08.01.2025)


Qualcomm and Hyundai Mobis collaborate on HPC platform to power next-gen ADAS and digital cockpit systems. The companies will combine Qualcomm's Snapdragon Ride Flex System-on-Chip (SoC) and Ride Automated Driving Stack with Hyundai Mobis' software and sensor for an ADAS solution.

#Partnership

(07.01.2025)


DeepRoute.ai partners with Smart to enhance intelligent driving functions. The partnership is planned to result in vehicles which are capable of handling complex scenarios, including parking, traffic circles and missing lane markings.

#Partnership

(24.01.2025)


Wayve expands to USA with testing program for ADAS and opened a new office in Sunnyvale (Silicon Valley). To support the testing, activities in the USA, Wayve will focus on software development, hardware integration and deployment operations to improve safety and convenience of ADAS functions.

#Safety

(24.10.2024)

US bans AVs from China and Russia: Department of Commerce issued a finalized rule on Tuesday, 14th January banning the sale or import of connected vehicle hardware for vehicle models from 2030 onwards and software for vehicle models from 2027 onwards originating from China or Russia.

#Policy

(15.01.2025)

# Further ADAS-related news

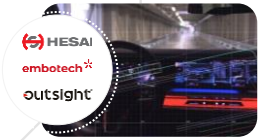
## Latest news


Dongfeng Nissan announced a strategic partnership with autonomous driving solution provider Momenta, aiming to jointly develop advanced intelligent driving solutions based on an intelligent end-to-end model. Features like navigation on autopilot (NOA) shall debut in the N7.

#Partnership (18.11.2024)


Rivian announced to plans to launch its advanced hands-free driver assistance systems in 2025 and its "eyes-off" systems in 2026. Current Rivian Gen2 vehicle with the “Rivian Autonomy Platform” feature L2+ functions, which as per definition require continuous driver attention and control of the vehicle.

#Announcement (24.01.2025)




Embotech, Outsight and Hesai, who jointly power technology for Automated Vehicle Marshalling (AVM) in BMW plants, announced further strategic cooperation, where Embotech acts as system supplier, Hesai delivers Lidar sensors and Outsight software solutions.

#Partnership (28.01.2025)


VW and Rivian contemplate a potential expansion their JV to further modules or bundling of procurement volumes. Moreover, there is alleged interest in the developed solutions from other, unnamed OEMs. However, short-term focus is on successful market launch of Rivian models and integration of the new technology into VW vehicles.

#Partnership (03.02.2025)

# Key Takeaways.

Summary and assessment

UPDATE

# Performance and functionality of Chinese systems is ahead of competition, especially for Level 2+ systems which have highest market shares in the next years

| | | USA OEMs | European OEMs | China OEMs |
|---|---|---|---|---|
| **Level 2** | Lane keeping & Active Cruise Control | Industry standard | Industry standard | Industry standard |
| **Level 2+** | Navigation on Pilot **on Highway** | Available by Tesla FSD Beta and GM, Ford | Available by BMW but limited in performance / ODD | Available for most CN highways |
| | Navigation on Pilot **in City Routes** | Available by Tesla FSD Beta 12.5. | N/A | Available even in most dense traffic situation in major cities |
| **Level 3** | **Traffic Jam Pilot** (max 60 km/h) (no driver supervision) | Limited availability by MB | Limited availability by BMW / MB (extended to 95 km/h) | Legislation pending– planned for 2025 |
| | **Highway Pilot** (max 130 km/h) (no driver supervision) | Not available yet | Not available yet – planned for 2025 | Legislation pending – planned for 2025 |

As major tipping points have been reached and **wide-spread adoption** is expected, the fierce competition in the ADAS market is intensified by **fast-learning Chinese players**. OEMs and suppliers need to set a **clear strategic path** to prevail in the market.

Low Maturity ◔ ◀▶ ● High Maturity

# We can help international ADAS players to draw strategic implications and critical actions for to succeed in the fast-growing ADAS Market.

## Exemplary implications and actions to be taken

### Architectural sovereignty + strong partnership

Full ownership for product (SW) stack required but max. leverage of partners and market existing assets

### Software Defined Vehicle Approach for ADAS

Drive abstraction not only for HW but also between operating system and application layers for parallelization

### “Tier 0.5”-model vs "Tier 1"

Integrate Tier’s (e. g. Huawei’s) system architecture incl. major components, leveraging existing building blocks, avoid custom builds (at least as parallel option)

### Implementation of geo-resilient ADAS stack

Geo-political developments as challenge for market entry of AD/ADAS system providers. How to ensure a geo-resilient ADAS stack?

### Future-proof ADAS sensor stack

Sensor setups as significant cost driver of the ADAS/AD stack. Suitable sensor selection and current trends as decision criteria to be future-proof.

## P3 Services

| | | | | |
|---|---|---|---|---|
| # Partner Screenings<br># Cooperation Management<br># Integration Support | # Architecture Reviews<br># SDV Readiness Benchmarks<br># SDV Best Practice Transfer | # Core / Non-Core Assessments<br># Supplier Reviews and Strategy<br># Supplier Management | # Product & Go-2-Market Strategies<br># Region-specific Homologation strategy & Roadmap | # Supplier selection processes<br># Product strategies<br># Technology assessments & Roadmaps |

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