
WHITE PAPER

# Driving Software-Defined Mobility with AVL

## Empowering OEMs with Platforms and Processes

# Executive Summary

AVL is a trusted partner in the transformation towards Software-Defined Vehicles (SDVs). With over 30 million vehicles on the road featuring AVL technology, and proven compliance with ISO 26262 as well as certifications such as ISO 21434 and TISAX, AVL combines deep technical expertise with proven delivery capabilities.


This document provides a snapshot of AVL's SDV portfolio, showcasing selected services designed to support OEMs in building dynamic, software-driven vehicle platforms. SDVs enable continuous connectivity, personalization, and over-the-air updates, unlocking faster time-to-market, cost efficiency, and new revenue streams.

AVL positions itself as an independent engineering partner with comprehensive SDV expertise. From concept to lifecycle. This document serves as an invitation to explore collaboration opportunities tailored to your specific needs.

## Key AVL SDV Capabilities:

- **E/E Architecture**
- **Electronic Hardware**
- **Basic Software & Middleware**
- **Application Software**
- **Functional Safety**
- **Cybersecurity**
- **Backend & Connectivity**
- **OTA (Over-The-Air)-Updates**
- **Diagnostics & Maintenance**
- **Development Process Enablement**

FEATURES

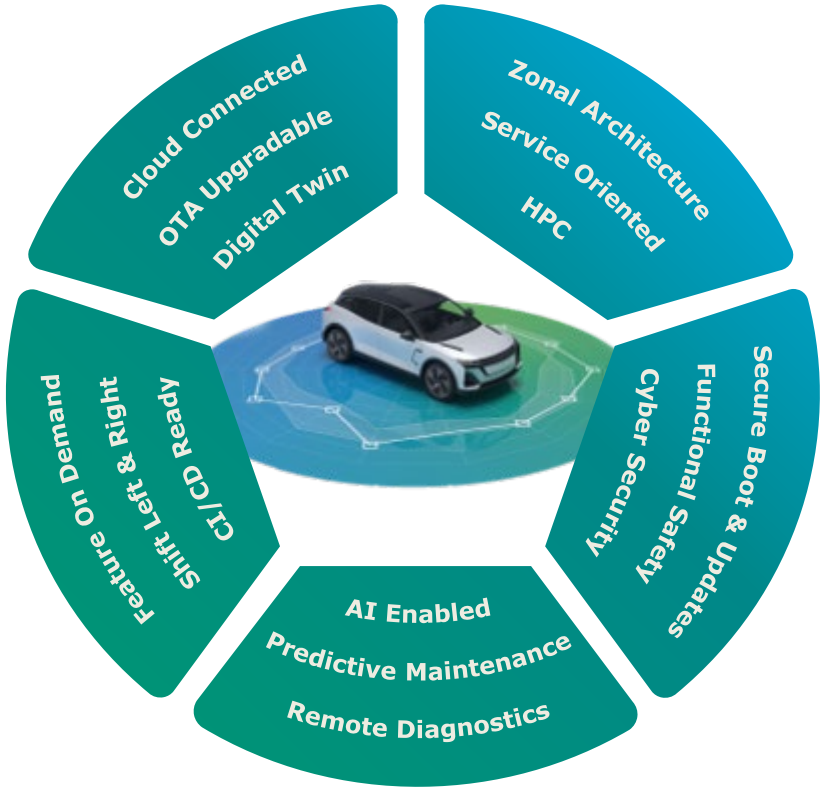
# Introduction

## The automotive industry is undergoing a profound shift.

Vehicles are evolving from static hardware systems into dynamic, software-driven platforms. This transformation towards Software-Defined Vehicles is reshaping how mobility is designed, delivered, and experienced.

AVL supports this transition with a comprehensive portfolio of engineering services and technologies tailored to the SDV lifecycle. With decades of experience, global reach, and deep domain expertise across software, hardware, safety, and cloud integration, AVL empowers OEMs to accelerate innovation while maintaining compliance and reliability.

This whitepaper outlines selected capabilities from AVL's SDV offering. It is intended to spark dialogue, identify synergies, and explore how AVL can contribute to your SDV strategy: from architecture and development to deployment and beyond.




## AVL is certified according to:

- **ISO 27001**
- **ISO 21434**
- **ISO 14001**
- **ISO 9001**
- **Automotive SPICE level 3 (ASPICE)**
- **Information security TISAX**

# The Challenge

**The transition to SDVs brings cross-domain complexity, requiring OEMs to rethink architectures and processes.**

| DOMAIN | KEY CHALLENGE |
|---|---|
| **E/E Architecture** | Migration to zonal/central HPCs; redesign of power and communication topology |
| **Basic Software** | Hybrid platforms (Classic/Adaptive AUTOSAR, POSIX, proprietary) increase complexity |
| **Application Software** | Centralized execution; modular logic and feature-on-demand readiness |
| **Hardware** | Diverse COM interfaces and high-performance SoCs:<br>Thermal, power, and EMC constraints with validation approaches |
| **Diagnostics & OTA** | UDS/SOVD coexistence; rollback, secure flashing, campaign orchestration |
| **Safety & Cybersecurity** | Compliance with ISO 26262, SOTIF, UNECE R155/R156; new OTA-related risks |
| **Process & Toolchain** | Agile/CI-CD adoption hindered by fragmented toolchains and limited test readiness |
| **Backend & Connectivity** | Secure vehicle-to-cloud and V2X integration; lifecycle connectivity |

# The AVL Solution – SDV Foundations

**The foundation of every SDV lies in its architecture, hardware, and software platform.
AVL provides the core building blocks to enable scalable, secure, and future-ready SDV systems.**

## E/E Architecture

Shaping the future of electrical/electronic (E/E) systems requires a shift from distributed ECUs to centralized high-performance compute platforms with zonal architectures. AVL supports this transition through architecture design, function partitioning, and integration of power and communication topologies.

**Included services:**

- E/E architecture design & consultancy
- Function definition and logical/physical partitioning
- Power distribution & communication topology
- Benchmarking & technology alignment

## Electronic Hardware

From concept to full production maturity, AVL offers comprehensive support for ECU and HPC hardware development*. This includes SoC integration, high-speed and EMC design, thermal optimization, and safety compliance.

**Included services:**

- Hardware concept & architecture design
- SoC hardware integration (Renesas, NXP, Aurix, Qualcomm, etc.)
- High-speed & EMC design
- Signal & power integrity simulation
- Power & thermal optimization
- Safety compliance & FMEDA analysis
- Schematic & layout design
- Hardware testing & prototype validation

## Basic Software & Middleware

Delivering SDV-ready platforms involves integrating AUTOSAR classic and adaptive, hypervisors, diagnostics stacks, OTA workflows, and secure middleware. AVL ensures seamless software integration tailored to safety and cybersecurity needs.

**Included services:**

- Static and dynamic architecture
- OS and hypervisor integration
- Middleware & device driver development
- Diagnostics stack (UDS, DoIP, SOVD)
- Communication stack
- Log and Trace solutions
- OTA setup & bootloader solutions
- Safety solutions (ISO26262)
- Cybersecurity integration (Full EVITA hardware as well as software-based solutions)

*see AVL Sample Products

# The AVL Solution – Intelligent Vehicle Functions

**Intelligent vehicle behaviour depends on robust application software, functional safety, and cybersecurity. AVL delivers integrated solutions that ensure performance, reliability, and protection.**

## Application Software

Service-based application software across propulsion, motion, ADAS, and digital features is key to SDV functionality. AVL's modular, toolchain-driven approach accelerates the development and integration of centralized coordination services and Feature-on-Demand capabilities.

**Included services:**

- Centralized vehicle coordination services
- Motion coordination & control
- ADAS/AD perception & sensor fusion
- Advanced battery management & inverter functions
- Drive/Brake/Steer-by-wire modules
- Feature-on-Demand enablement
- Calibration & validation for SDV functions

## Functional Safety

Ensuring ISO 26262 and SOTIF compliance from the start is essential for SDV platforms. AVL helps customers design robust safety concepts for centralized and zonal architectures, including analysis, integration, and lifecycle support.

**Included services:**

- Safety concept design & function allocation
- Safety analysis (HARA, FMEA, FTA)
- OS/middleware safety integration
- Safety case creation & lifecycle support
- SOTIF (ISO 21448) compliance

## Cybersecurity

Embedded across all SDV domains, cybersecurity at AVL covers compliance, secure communication, penetration testing, and continuous monitoring. Our processes align with ISO/SAE 21434 and UNECE R155/156 standards.

**Included services:**

- Cybersecurity architecture & concept development
- TARA risk analysis & compliance support
- Secure OTA strategy & communication
- Penetration testing & vulnerability management
- Continuous monitoring & incident response
- Training & consulting for OEM/Tier1 readiness

# The AVL Solution – Connectivity & Lifecycle

**Seamless connectivity and lifecycle management are essential for modern vehicle fleets. AVL enables secure data exchange, efficient OTA updates, and predictive diagnostics across platforms.**

## Backend & Connectivity

Seamless vehicle-to-cloud integration and lifecycle connectivity are critical for SDV operations. AVL enables backend orchestration, telematics integration, and secure communication across fleets.

**Included services:**

- Cloud platform integration (AWS, Azure, AVL DECL*)
- Telematics integration & data routing
- Backend platform setup & analytics
- V2X stack integration & validation
- Secure vehicle-to-backend communication

## OTA Updates

End-to-end OTA solutions require backend orchestration and secure in-vehicle flashing. AVL ensures regulatory compliance while enabling new feature delivery, rollback strategies, and predictive diagnostics.

**Included services:**

- OTA architecture design & integration
- Update orchestration & campaign management
- Secure OTA delivery & rollback strategies
- Remote diagnostics & predictive maintenance
- SOP-ready OTA consulting and delivery

## Diagnostics & Maintenance

As diagnostics evolve from ECU-based to service-oriented approaches, AVL provides scalable solutions for legacy and SDV platforms. This includes predictive maintenance, SOVD development, and fleet analytics.

**Included services:**

- OBD & regulatory diagnostics design
- ASAM SOVD development & validation
- Automated rollback validation for OTA diagnostics
- Backend integration for predictive maintenance
- Event detection & fleet analytics

*see AVL Sample Products

# The AVL Solution – Development Acceleration

**Accelerating SDV development requires agile workflows, automation, and robust toolchains. AVL empowers OEMs with tailored methodologies and integrated tools to streamline the entire development cycle.**

## Development Process Enablement

Rapid SDV deployment demands CI/CD integration, virtualization, and scalable toolchains. With its MAESTRA®* suite and deep process expertise, AVL enables seamless development workflows and supports agile transformation across teams.

**Included services:**

- **Process methodology consulting**
- **CI/CD integration & automation**
- **Virtualization for ECU/HPC testing**
- **Agile coaching & DevOps transformation**
- **Toolchain customization with AVL MAESTRA®**

*see AVL Sample Products

# AVL Sample Products

## High-Performance Computing

AVL's Ajunic® is a versatile and rapid development platform that is tailored to your specific application needs and provides a secure environment that significantly reduces development time.

Due to its adaptability, it is suitable for both prototypes and series production. The platform supports advanced functionalities such as ADAS/AD perception, sensor fusion, motion control, ground truth data recording and real-time object recognition.

## End-to-End Data Analysis

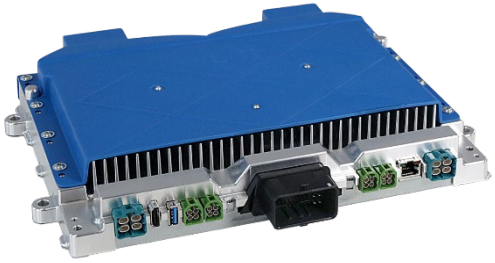
AVL DECL is our IoT platform designed to support the evolution toward SDVs. It enables seamless data collection from sensors, ECUs, and test environments, processes it at the edge, and delivers actionable insights via the cloud.

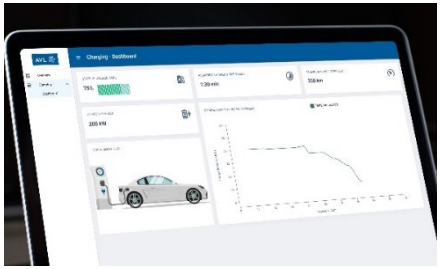
By making operational data transparent and accessible, DECL helps identify optimization potential across vehicle functions, energy usage, and system behavior, accelerating development cycles and enabling smarter decision-making in connected vehicle ecosystems.

## Orchestrate Processes

AVL MAESTRA® structures the development process, builds intelligent interfaces between tools, and supports the entire model-based workflow.

From requirements engineering to virtual testing. It enables agile CI/CT workflows while ensuring compliance with ASPICE and ISO 26262, even up to ASIL D.

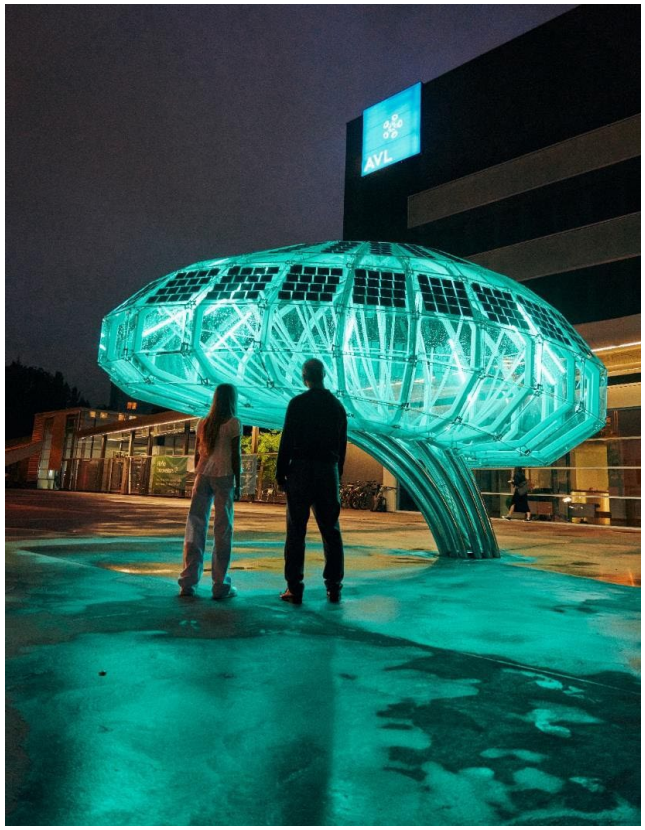




# Conclusion

## Shaping the future together:
## With AVL as your SDV Partner!

The shift toward Software-Defined Vehicles is multifaceted – but with AVL, OEMs gain a reliable partner with deep expertise and a holistic approach. By combining technical excellence, cross-domain integration, and active involvement in key SDV initiatives, AVL delivers more than just solutions: it provides clarity and direction. Whether it's architecture design, toolchain integration, or scaling to production, AVL stands for speed, scalability, and security.




### AVL‘s Value Proposition in SDV:

- **Proven OEM partnerships – Trusted by premium customers in SDV programs, delivering solutions in SOA, POSIX, middleware, hypervisors, OTA/FoD, and diagnostics.**
- **Comprehensive SDV expertise – From E/E architecture and HPC/zonal hardware to BSW, ASW, OTA, backend, safety, and security.**
- **E/E Architecture excellence – Extensive benchmarking database and holistic concept development enabling scalable, SDV-ready architectures.**
- **Cross-domain leadership – Powertrain and e-mobility heritage combined with ADAS, infotainment, chassis, and connected services.**
- **Process & tools excellence – Agile/CI-CD enablement, ASPICE/ISO-compliant workflows, model-based development, and advanced SDV validation (SIL, HIL, XiL, vECUs).**
- **Ecosystem & agility – Active in Eclipse SDV, Federate, HAL4SDV, Shift2SDV, and S-Core, with rapid ramp-up and flexible engagement models.**

# Inquiry

## Help us tailor your SDV journey and take our short 3-question survey.

To better understand your specific needs and tailor our first conversation accordingly, we invite you to complete a short survey via the link on the right side.

It includes questions about your company's SDV maturity level and about the topics you're most interested in – ranging from E/E architecture and cybersecurity to OTA updates and development process enablement.

Your input will help us align our support with your priorities.

**Scan the code or use the link to reach the survey:**

AVL-SDV-Survey


AVL Software and Functions GmbH
Im Gewerbepark B29
93059 Regensburg
Germany

E-mail sdv.sfr@avl.com
www.avl.com