3_2026

www.all-electronics.de
D 61060

AUTOMOBIL ELEKTRONIK

E/E-Entwicklung für Entscheider

all-electronics.de

REPRINT

SECOR
CHIPS & LIBRARY

SDV – Complexity out. Speed in.

The quantum leap for software-defined vehicles.

Dr. Hartwig Schwerdtle,
CEO SECOR Group GmbH

Klaus Jungbauer,
CTO SECOR Chips & Library GmbH

SDV – Complexity out. Speed in.

The quantum leap for software-defined vehicles

Contrary to the Industry's focus on Software optimization over the last decade, Secor is presenting the SDV PoC 2.0 at the AEK – a holistic, open-source approach, 50% shorter time-to-market, 30% lower development and production costs.

Software-defined vehicles (SDVs) are the next evolutionary stage of the car, putting the customer at the center. They must also address rising SW complexity, industrial requirements and fragile supply chains. Most SDV concepts only solve a piece of the puzzle; the structural challenges remain intertwined across technical, economic and geopolitical dimensions. A holistic approach is required.

Customer expectations: Smartphone-like usability and the ability to personalize one's own vehicle through SW - this expectation has been articulated in the industry for over a decade. It has yet to be fulfilled. Furthermore, today's customers also expect SW updates without a service center visit.

Software complexity and no reuse: Over-the-Air (OTA) updates have been a persistent challenge for years. Updating SW across multiple ECUs (electronic control units) without a service center visit is complex, because neither the SW architecture nor the vehicle network is designed for it. ECUs also require a secure fallback to remain operational in the event of update failures. As a result, OTA updates remain largely confined to a few non-critical control units. With each new vehicle development, ECUs are re-tendered and implement-

ed with new MCUs (micro control units), as their production cycles are limited. This means existing SW must be recompiled and, to a large extent re-coded (up to 80%). This lengthens development, increases the risk of errors and prevents reusability, while new market entrants continue to intensify time-to-market pressure.

Industrial requirements: OEMs and Tier-1 suppliers must maintain vehicle SW over the full lifecycle, yet face limitations due to different hardware (HW) revisions, complex wiring harnesses and the absence of standards. At the same time, the shift to zonal E/E architecture demands far-reaching changes in development and supply chain qualification. Open-source middleware such as Eclipse SDV aims interoperability, but adds governance, security and integration risks. Furthermore, the OEM-specific app stores currently in use are proprietary and fail to generate cross-brand economies of scale.

Volatile supply chains and geopolitical dependency: Unstable supply chains put production at risk, as cost considerations have led to single-source dependencies for many critical components. The wiring harness illustrates this best: nearly every unit is a custom build, and a single missing harness is enough to halt the entire production line. The same applies to ECUs, MCUs and other non-substitutable components. A future-proof SDV must build resilience into the system, rather than treating it as an emergency response. All of the requirements above are met by the Secor SDV Ecosystem described below.

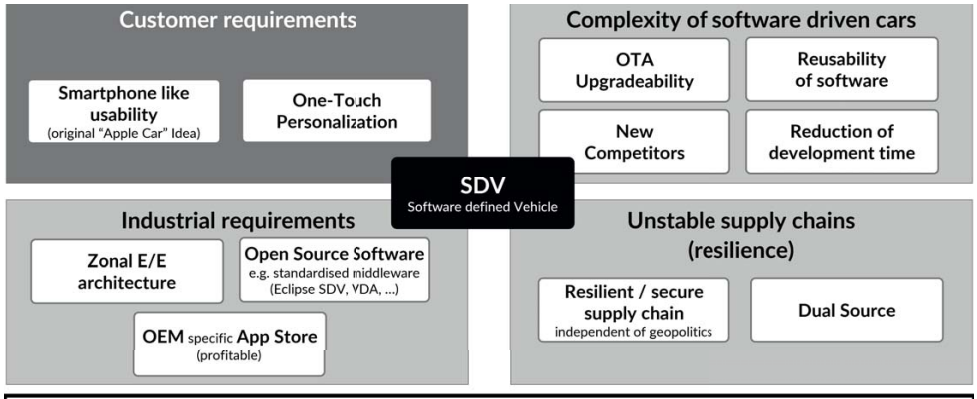


Figure 1: The four main challenges for the SDV. A holistic approach is required.
Picture: Secor

SDV Ecosystem - Introduction

Many SDV concepts address individual problems. But what if the goal is to shape a future vision rather than optimize one issue at a time?

That is precisely the step Secor has taken. The starting point were the challenges described above. These cannot be resolved incrementally - they are far too deeply intertwined for that. The solution can only be a holistic approach: an ecosystem specifically designed for these requirements and flexible enough to meet the demands of the future. Drawing on extensive automotive expertise, Secor has developed exactly that – and will be presenting the Secor SDV PoC 2.0 at the 30th AUTOMOBIL-ELEKTRONIK Kongress.

The essence is standardization:

The patent-pending Secor SDV Concept is the only offering on the market that relies on standardized SW and HW. Since its presentation at embedded world 25, it has accordingly been described by experts as a game changer and a paradigm shift for the automotive industry.

Resilient HW: Thanks to its function-compatible design, the HW is interchangeable - both at SOP and even twenty years later. At the same time, the HW is multifunctional and built for resilience. Its architecture uses chiplets to create a scalable RISC-V MCU family, making it easier to adapt and port to new manufacturing processes. Because of this design, the HW will be produced simultaneously at three fabrication facilities across different continents, helping ensure a stable supply even during geopolitical disruptions.

Software reuse: The SW is modular and can be reused across multiple vehicle generations. It is provided through a certified SDV library, ensuring it matches the maturity level of the previous vehicle and is reliable and error-free as the previous generation of vehicles.

In addition, it supports **3rd-party SW** integration, allowing applications to be distributed through an **SDV app store** for both B2B and B2C use.

The Secor SDV delivers the following benefits:

- Interchangeable semiconductors from development through after-sales, across vehicle generations - enabling the refurbishment of both newer and classic vehicles
- Resilient, multifunctional semiconductors supported by secure multi-sourcing at competitive costs
- Modular, error-free SW with certified interfaces as error-free as the previous generation of vehicles
- Shorter development cycles, improving competitiveness in time, cost, quality and environmental impact

These advantages for OEMs and Tier-1 suppliers are measurable (cf. AEL 05/2025, p. 48):

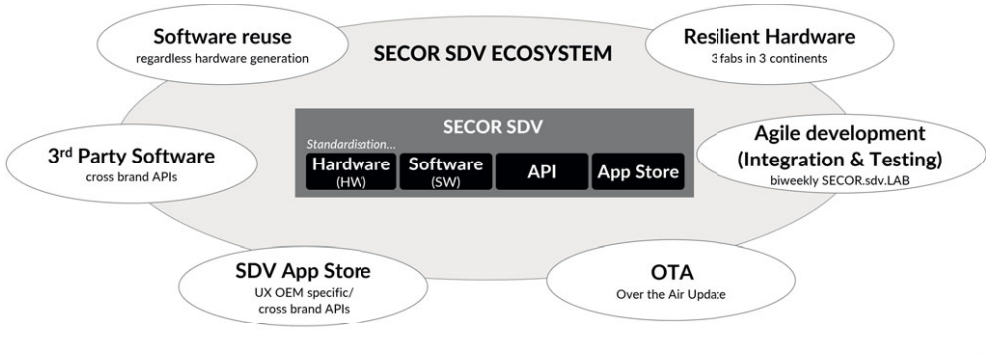


Figure 2: Secor is a holistic SDV Ecosystem with a robust core consisting of standardized HW, SW, APIs and an app store.
Picture: Secor

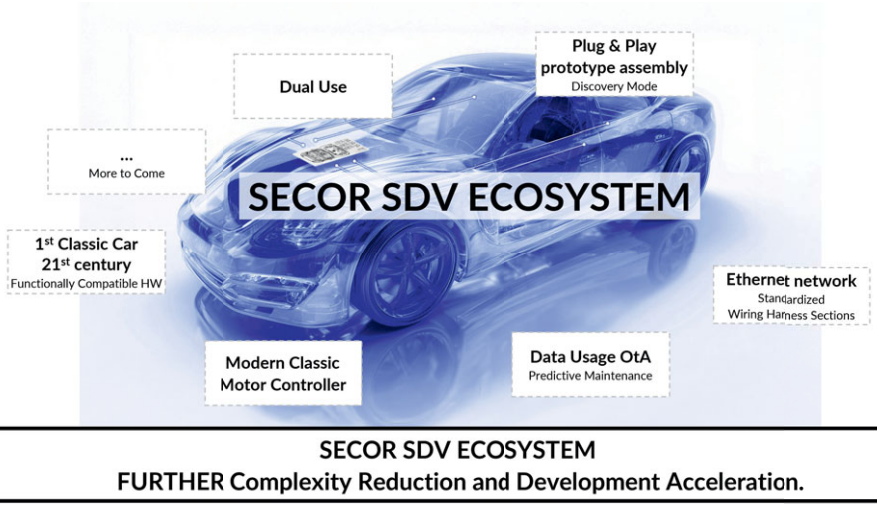


Figure 3: The Secor SDV Ecosystem serves as the foundation for significant technical innovation that goes beyond the status quo.

Picture: Secor

- 50% shorter time-to-market through standardized SW modules
- 30% lower development and production costs through reusability
- Resilient supply chains through pin- and function-compatible alternatives
- Longer service life and resource-efficient production

Secor SDV – In a nutshell

To overcome the MCU dilemma, Secor - together with Fraunhofer IIS – is developing a flexible and powerful MCU designed to remain functionally compatible for decades. This approach is inspired by the x86 processor, which has been used in standard PCs for over 40 years. Similarly, the new RISC-V–based MCU is built for long-term consistency and scalability. To ensure supply resilience, the MCU is designed to be manufactured at three fabrication facilities (fabs) across different continents, reducing the risk of disruption. Because the HW interfaces remain stable, the SW changes typically required with each new MCU are no longer needed. Existing SW can be reused, significantly reducing development time. Fewer changes mean fewer newly introduced errors – reducing the need for time-consuming debugging and resulting in substantial savings in both time and cost.

The SW architecture is structured so that the base level realizes the HW abstraction down to the component level (Level 3). The next SW level handles functional logic (Level 2), previously delivered by suppliers alongside their ECUs. In the new zonal/central E/E architecture, SW is decoupled from HW. Therefore, the functional logic can now come from the supplier, the OEM, a third party, or an open-source project such as Eclipse S-Core. On top sits the user interface with the OEM's brand identity (Level 1). These SW layers are connected via multiple APIs (Application Programming Interfaces) based on the COVESA VSS (Vehicle Signal Specification), drawing on an established industry standard.

Thanks to the standardized APIs, the SW modules of the functional logic (Level 2) can be traded in the B2B SDV app store - including to new customers. Since this does not affect the UX level, no OEM-specific brand interests are compromised. Through API-based abstraction, the modules are vehicle- and brand-independent. An OEM can therefore equip its prototype or technology demonstrator with functional SW modules from the SDV app store for direct use or further adaptation.

End customers can buy apps for their vehicle through a brand-specific B2C app store or replace existing apps with new ones. OEMs can also offer subscription-based services, such as access to exclusive SW features or modules.

Agile development (Integration & Testing biweekly with SECOR.sdv.LAB)

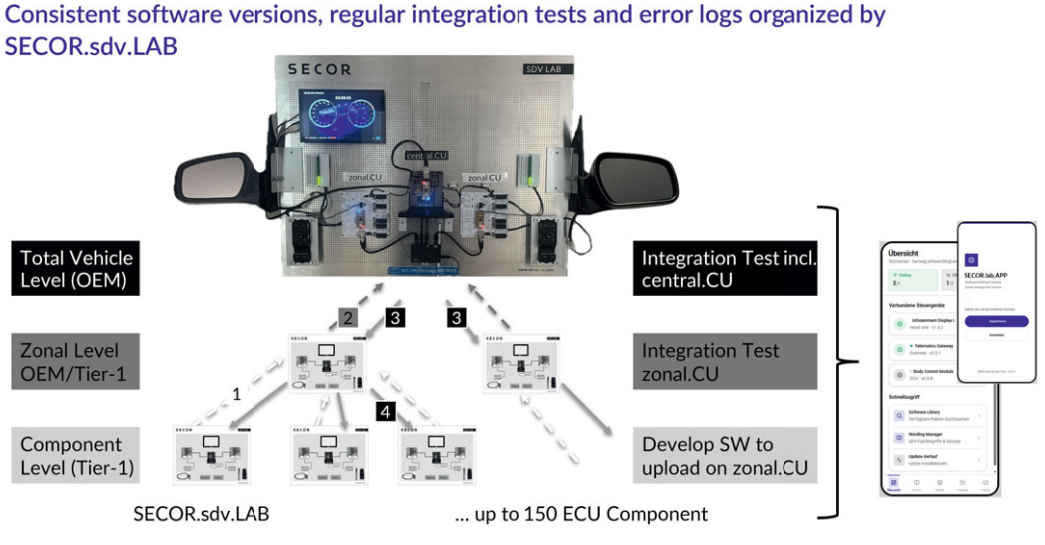
In the SDV context, "integration is the supreme discipline" from a technical standpoint (cf. AEL 01/2026, pp. 26–27).

With SDVs, integration becomes the key challenge. It largely determines how long the product development process (PDP) takes and how quickly SW and HW are ready for SOP. All SW modules must be combined into a single, type-approval-ready system. In the Secor SDV Ecosystem, standardized HW removes the need for SIL (SW-in-the-Loop) testing. The SECOR.sdv.LAB provides all Tier-1 suppliers and partners with the same HW setup - one central control unit and two zonal control units - allowing integration work to be distributed across development sprints.

Early integration results are then brought together at the OEM level for full system integration. This process is supported by the SECOR.lab.APP, which connects all partners in a project and ensures everyone is working on the same

Figure 4: Secor.sdv.LAB and the Secor.lab.APP are a continuous integration and continuous deployment (CI/CD) solution that will accelerate the development process by at least six months.

Picture: Secor



SW version, with OTA updates every 14 days.

Additional tools like user management and shared defect tracking improve efficiency across companies involved in the PDP. Simulations and regression testing help identify errors earlier, reduce complexity and speed up development.

Discussions with homologation service providers suggest further efficiency gains are possible. Overall, this leads to a consistent "shift-left" approach, where issues are addressed earlier in the development cycle.

SDV SOP dates are often delayed, mainly due to the complexity of integrating K-matrices / communication matrices.

In the Secor SDV Ecosystem, this complexity is removed. A flexible E/E architecture, combined with a patent-pending Message Broker, manages communication between the central control unit (central.CU) and multiple zonal control units (zonal.CUs).

Similar to how the internet works, each SDV component is assigned to its own IP address. These addresses are managed by the Secor directory service, simplifying communication and reducing integration effort.

OTA updates are available at any time, allowing new features and improvements to be rolled out rapidly. This enables continuous development, integration and testing, as well as the ongoing deployment of SW into vehicles. This results in SW living on beyond the individual vehicle into its successors.

The ecosystem supports both central and zonal E/E architectures, though Secor favours the zonal variant due to its clear advantages for the wiring harness. By dividing the vehicle into zones, wiring harnesses can be standardized and variants significantly reduced. At the same time, the quantity and length of cables decrease, reducing both weight and cost. This lower variance and also increases efficiency in the supply chain and OEM assembly.

A further advantage of the zonal architecture is that SW for uninterrupted applications can be distributed into the zonal. CUs. This reduces the power demand – and the resulting heat dissipation – at the central.CU.

SDV Ecosystem – Further R&D roadmap

The in-vehicle communication networks are being shifted toward full Ethernet. As a transmission technology, Ethernet supports a wide range of protocols, including well-known ones like Internet Protocol (IP) and Time-Sensitive Networking (TSN).

It can run over different media, such as twisted pair, coaxial cables and plastic or glass fiber. Available bandwidths range from 10 and 100 Mbit/s up to 1–10 Gbit/s, which is more than sufficient for future vehicle requirements.

In the Secor SDV PoC 2.0, 10 and 100 Mbit/s bandwidths are currently used.

Plug-and-play

In the current (patent-pending) development, every component becomes plug-and-play. As soon as it connects to the vehicle network, it automatically receives a local address. The component then provides metadata - such as manufacturer, product code, capabilities and control details - which is stored in a directory service. Based on this information, the required SW modules are automatically downloaded, allowing the component to be used immediately. This enables rapid prototyping with flexible combinations of components. In production, components can be replaced without requiring new development. In after-sales, the directory service allows precise identification of installed parts and compatible alternatives, even if they are not identical. Any changes to control parameters can be delivered OTA, similar to driver updates.

Data usage is managed through a central API that handles and distributes all events and data. This data can be logged and sent to the cloud for use in applications like predictive maintenance. During development, it is also possible to record driving cycles with precise timing, which can then be used as input for simulations in development and system integration.

Take an active role in the SDV transformation

The next PoC will be the Bavaria+ SDV 1.0 FPGA at IAA Mobility 2027. Secor is already actively working with a handful of companies on its implementation. You have the opportunity to become part of the new SDV Ecosystem and contribute your components or a concept vehicle. Due to the higher material unit costs for an FPGA-based central.CU and zonal.CU, the Bavaria+ SDV 1.0 targets small-series production.

These vehicles could become the first automobiles of the 21st century that future generations will still cherish as classics. Work is already underway on a silicon-based central.CU and zonal.CU designed for high-volume production, with market readiness planned for IAA Mobility 2029 (Bavaria+ SDV 2.0). *(na)* ■

Authors: Dr. Hartwig Schwerdtle, CEO Secor Group
Klaus Jungbauer, CTO and Founder Secor Group

If things seem under control you are just not going fast enough.

Mario Andretti, Formula 1 World Champion 1978

True on racetrack. True in SDV development.

Up to 50% shorter time-to-market.
Around 30% lower development and production costs.
With the first holistic SECOR SDV ECOSYSTEM.

Get more

Be part of us. Beyond mainstream.
Become a partner in the SECOR SDV ECOSYSTEM.

Holistic SDV hardware, software and ecosystem solutions
for OEMs and Tier-1 suppliers – 100% made in Europe.
hartwig.schwerdtle@secor.group

SECOR
CHIPS & LIBRARY

www.secor-cl.com