S&P Global
Mobility

AutoTechInsight Insights
August 2025

The effect of the software-defined vehicle on chassis systems — interview with BWI Group

05-Aug-2025 10:09 GMT

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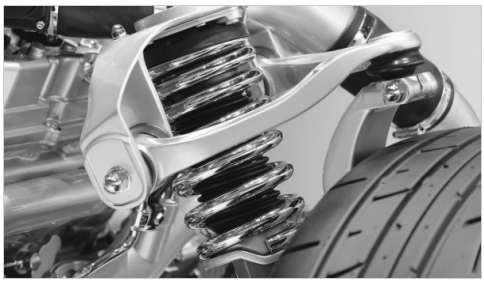
Q&A with BWI Group



Source: Getty Images

The rise of software-defined vehicles (SDVs) is revolutionizing chassis systems, transforming them from simple mechanical frameworks into sophisticated, software-driven powerhouses. This shift is all about enhancing performance, safety and comfort through advanced technology.

A major game-changer in this evolution is the integration of advanced driver assistance systems. These systems harness data from multiple sensors and cameras to improve vehicle control and stability. For example, adaptive suspension systems can now adjust in real time based on road conditions and driving styles. This is not just a nice-to-have feature; it is a fundamental change in vehicle dynamics, allowing the chassis to respond intelligently to real-time data for a smoother ride and better handling.

Electrification is another critical factor reshaping chassis design. Electric vehicles benefit from a lower center of gravity due to battery placement, which enhances stability and handling. However, it is the software that really optimizes this performance. Features such as regenerative braking and torque vectoring are becoming standard, delivering not just efficiency but an exhilarating driving experience.

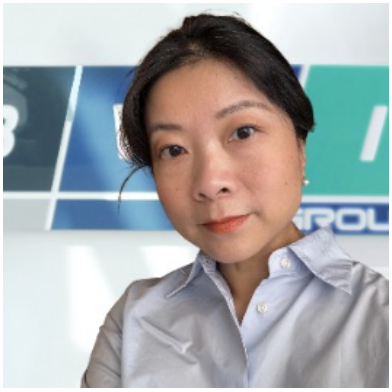
That said, this transformation is not without its challenges. The complexity of integrating various software components can lead to compatibility issues and rising development costs. As vehicles become more connected, the risk of cyberthreats increase. Manufacturers must invest in robust cybersecurity measures to protect their systems from potential hacks.

The SDV era is also reshaping the relationship between traditional automotive suppliers and original equipment manufacturers. Suppliers are evolving from mere component providers to essential development partners, contributing significantly to the changes in vehicle architecture. This new dynamic requires deeper technical integration and long-term partnerships, enabling solutions that are optimized for the entire vehicle system.

As OEMs shift to SDV architectures, there is a notable move toward consolidating responsibilities by functional domains. Suppliers must adapt to a centralized architecture that integrates communication, power, safety and security across the vehicle. This shift demands that domain-specific suppliers not only retain their technical expertise but also align their systems with broader vehicle strategies.

To gain further insights into these developments, we spoke with Yuan Zamparini, global chief engineer for Controls, Electronics & Software for Controlled Suspensions at BWI Group. She noted that BWI is increasingly involved in defining the electronic architecture of its domain, ensuring its solutions work seamlessly with OEMs' central and zone controllers. This flexibility allows OEMs to maintain control over their vehicle architecture while leveraging the specialized expertise of suppliers.

The SDV landscape is creating new opportunities for digital chassis systems. By connecting the chassis to other vehicle subsystems, suppliers can use data from cameras and radar to optimize suspension performance in real time. This integration can enhance safety by adjusting suspension dynamics during emergency braking, ultimately improving braking distances and control.



[Source: BWI Group]

The following is an edited transcript of the conversation:

S&P Global Mobility: How do you see the relationship between traditional automotive suppliers and OEMs evolving in the SDV era?

Yuan Zamparini: The relationship is becoming more collaborative and integrated. Rather than simply supplying individual components, we're becoming development partners. We are contributing to the fundamental changes, which are happening to the vehicle architecture. This requires deeper technical integration and long-term partnerships, but it also enables solutions that are much more optimised for the complete vehicle system. We are also responding to an increased demand for a more modular approach to delivery. OEMs want to be able to pick and choose elements of the solution that best fit their architecture.

As OEMs transition to SDV architectures, are we seeing a consolidation of suppliers by functional domain — where, for example, one supplier handles the full chassis domain, another the cockpit, and so on?

We're already seeing this shift take place. In the domain-based architecture phase, many OEMs began consolidating responsibilities by system domain, assigning chassis, powertrain, body and ADAS domains to specialist suppliers, for example. However, many OEMs are now bypassing this intermediate step and moving directly toward a centralised architecture. This model centralises the processing power and introduces a unified communication, power, safety and security architecture across the vehicle, but it's also more complex to achieve.

For suppliers like BWI Group, this means adapting to the OEM's holistic vehicle strategy rather than focusing purely on one domain. While domain-specific suppliers continue to offer deep technical expertise, they must now tailor their systems to fit into a centralised vehicle architecture. This marks a second phase of transformation, moving from being domain specialists to becoming flexible technology partners who align with the OEM's broader SDV vision.

Will suppliers like BWI Group play a role in defining the electronic architecture of their domain — and if so, could this lead OEMs to integrate only that supplier's components within the domain?

OEMs typically prefer to maintain flexibility and avoid locking themselves into a single-source strategy. We are focusing on providing flexible modular solutions that can integrate with both the OEM's central controller and the zone controller. This approach gives OEMs more control over their vehicle architecture while still benefiting from specialised expertise.

In the SDV era, we're increasingly being invited to contribute to the definition of the overall vehicle architecture, not just at the component level. Our deep experience with real-time systems and both standard and adaptive AUTOSAR elements gives us valuable insight into how chassis functions can be orchestrated within a broader electronic architecture.

Are there any SDV partnerships with OEMs that you can discuss?

We're currently involved in a co-development program with a major US OEM for its first SDV platform. The customer established its SDV development roadmap back in 2021 and, given our long-standing relationship and the central role our semi-active suspension technology, MagneRide, plays in the SDV architecture, the customer invited us to participate from the beginning. They have now built prototypes for benches and vehicles, and we have supplied the entire digital suspension ecosystem; including the dampers, algorithm in the central controller, smart actuator controller with Ethernet capability and associated sensors.

SDV is transforming all aspects of vehicle design. How is it affecting chassis systems in particular?

The most obvious shift is that all systems are becoming more connected and software-driven. Instead of treating each feature separately, SDV architectures allow a central controller to manage them collectively and cooperatively, making the chassis control a truly integrated part of the vehicle's ecosystem.

However, a critical part of this transition is to digitise what has traditionally been a hardware-centric subsystem. Without digital control, the level of integration and opportunities to maximise the shift to SDV architectures are limited.

What new opportunities do SDV architectures unlock for digital chassis systems?

Integrating the chassis digitally with other vehicle subsystems is opening up some interesting opportunities. For example, connecting the vehicle's perception system to the chassis is now possible, thanks to SDV architectures. We can use cameras and radar to evaluate road surfaces ahead and prime the dampers accordingly and request feedback through the infotainment systems. This ultimately increases the performance of the suspension, gives OEMs more flexibility, and offers the end consumer more interactive and ludic features.

This integration can also be used to optimise the suspension in emergency situations when integrated with ADAS. If automatic emergency braking is triggered, the suspension system can be optimised to improve braking distances and control. The improvement is only a safety enhancement, not a mitigation mechanism, but in life and death situations, every advantage matters.

How is artificial intelligence being integrated into digital chassis systems?

One of the key use cases is to accelerate the development process and reduce costs. We are developing an AI-based self-learning tuning system for MagneRide. The semi-active suspension uses an array of parameters and inputs, and varies significantly based on vehicle type, size and intended use. This AI system dramatically reduces both the cost and time required for tuning and testing, while ultimately delivering better performance through continuous learning and optimisation.

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