



## “Simulation is the key to bringing innovations to the road in a faster and safer way”

Ansgar Hoffmann, AUMOVIO SE

We spoke with Ansgar Hoffmann, Senior Software Engineer at AUMOVIO (previously Automotive group sector of Continental; independent listed company since September 2025). He provided fascinating insights into how simulation, continuous integration and a modular platform architecture accelerate motion control software development, and why these approaches are decisive for the future of software-defined vehicles.

This interview was conducted by Henning Kemper, Senior Specialist Editor, IPG Automotive GmbH

### Could you introduce yourself and your field of work?

**Hoffmann:** Of course: I am a Senior Software Engineer at AUMOVIO, one of the largest technology and electronics suppliers in the automotive industry, responsible for simulation and test management in the field of holistic motion control (HMC). This is our central software platform for automated, assisted and manual driving. For many years, I have been bridging software development, simulation and vehicle dynamics; from traditional assistance systems to ADAS to complex heavy-duty vehicle projects.

Simulation-driven development and continuous integration are essential for me, as they help us ensure quality and safety already during the conceptual phase. Simulation is the key to bringing innovations to the road in a faster and safer way.

### What are the goals of your division?

**Hoffmann:** Our strategic focus is clearly set on efficiency, quality and safety. Our aim is to develop motion control software that makes vehicles truly defined by software. At the core of it all is our HMC platform: a central motion controller for multi-actuator control which integrates brakes, steering, driveline and suspension.

We work entirely model-based and simulation is the heart of our development process. This

allows us to test functions early on and independently of hardware. The platform is modular and scalable, which means it can be integrated seamlessly into a variety of vehicles and hardware platforms.

### Which role does simulation play in your development process for HMC software, especially regarding quality and reliability?

**Hoffmann:** For us, simulation is central to the entire development process for vehicle dynamics in HMC. We perform closed-loop simulations with CarMaker, which enable us to test the interplay of all actuators already in the conceptual phase, long before physical hardware is available.

We start with model-in-the-loop (MIL) tests and move up to software-in-the-loop (SIL) with production code in a virtual ECU to achieve results that are as close to reality as possible. In this way, we can safely and efficiently test different vehicle configurations, powertrain variants and critical scenarios. Simulation is firmly integrated into our test strategy and CI pipeline. Customers hence benefit from shorter development cycles, lower costs and higher system safety.

### How did you integrate CarMaker into your CI/CD/CT pipeline, and what specific feedback does simulation provide your developers in their daily workflow?

**Hoffmann:** We have fully integrated CarMaker into our CI/CD/CT pipeline which is based on Jenkins and the tool-chain from MathWorks. With our model-based development, we use the MathWorks integration to automatically perform closed-loop simulations. For specific components, we additionally generate input vectors for open-loop simulations with CarMaker.

Our test catalog is very extensive and directly geared to functional requirements. It covers both standard scenarios and corner cases. Simulation serves as an early functional test in this context: After every change of code, developers receive feedback right away, including KPI evaluations. We perform regression tests on a regular basis and have adapted the ISO 26262-compliant MathWorks process to our specific requirements. In this way, we can automatically test different vehicle variants and identify faults as early as possible.

### You are using MIL and SIL simulations to validate HMC platform functions already in early conceptual phases. Can you explain how you do this and what the advantages of this approach are?

**Hoffmann:** To do this, we run MIL simulations directly from our Simulink models. CarMaker is the first integration platform with which we are carrying out closed-loop simulations for realistic vehicle dynamics and multi-actuator control.

As soon as the functionality is verified in the model, we switch to SIL tests with production code in a virtual ECU, including further components in addition to the application software. The SIL environment is provided by our software factory that we are using for other products as well. In this way, we can seamlessly reuse existing processes.

This approach allows us to test requirements early, develop a wide range of HMC variants for different powertrain concepts and work completely independently of hardware. Developers get feedback right away, either directly from simulation or automatically via the CI pipeline.

### How do you handle the variety in vehicle, powertrain and actuator variants that you need to cover?

**Hoffmann:** With our modular architecture, we cover the variety of vehicle and powertrain variants. By decoupling hardware from software, we can provide multi-actuator control functions such as accelerating, braking and steering with great flexibility for different car configurations.

The variants are configured via our variant handling and then tested in MIL simulations with CarMaker. We test different vehicle and powertrain combinations in closed-loop simulations to validate the interplay of

all actuators realistically. The CI pipeline performs these tests automatically for all relevant variants and provides developers with direct KPI evaluations.

### What relevance does software modularization have for your platform and how is this reflected in your test and simulation approach?

**Hoffmann:** Software modularization is a key architectural principle of our HMC platform and is based on the logical level. Our HMC modules can be used flexibly, either individually or as a complete function package, covering different functions for vehicle dynamics.

First, we test every module individually, starting with unit tests and MIL simulations. Then, we integrate the modules in CarMaker to test the interplay in the complete system. MIL is the enabler for us to be able to test without hardware in the first place.

For us, modularization offers clear advantages: reusability, scalability, platform autonomy and quick integration of new functions.

### Which typical problems can be identified and solved early on using simulation, before integration into the ECU takes place?

**Hoffmann:** Wrong signal mapping, faulty interface setups

between actuators or unstable vehicle dynamics in critical scenarios for example.

MIL simulation with CarMaker is our key tool for this. It shows us immediately if changes in code have unexpected effects, this is particularly important in large development teams with daily modifications. For larger changes in the architecture or when refactoring software, MIL is extremely helpful.

In addition, we safeguard the stability of existing functions with regression tests. For our customers, this translates into higher quality, faster development cycles and much less expensive hardware tests.

### How do you ensure the future reliability of your simulation and test strategy, especially regarding rapid prototyping, scalability and requirements pertaining to ISO 26262?

**Hoffmann:** For us, future reliability means staying flexible, integrating new technologies early and adhering to the highest quality standards. With the rapid prototyping platform Speedgoat, we can test new functions quickly and under real-life conditions before they undergo formal testing. The HMC platform is scalable – from individual modules to complete driving functions for different vehicle variants.



Ansgar Hoffmann (left) in conversation with Henning Kemper

We are working in compliance with ISO 26262 and ASPICE, so that safety and quality are firmly integrated in the process from the beginning. By integrating new tools and technologies, including AI support at AUMOVIO, we are always at the cutting edge of technology.

Let me give you an example: After optimizing the control strategy, we seamlessly transferred it from the CarMaker environment to Speedgoat, with no need for laborious modifications. In this way, we were able to test the function in the physical vehicle within a very short time, directly from the simulation models. The result is a new function that

was developed quickly, tested safely and integrated into the platform in a future-proof way – and is now ready for use in upcoming vehicle generations.

### In your opinion, what are the priorities in the advancement of simulation, CI/CD/CT and platform architecture?

**Hoffmann:** Our main focus is to make simulation even more realistic, to integrate more automated scenarios and to further accelerate iteration cycles. This allows us to validate functions already during the conceptual phase. At the same time, we are pushing forward the further development of our CI/CD/CT pipeline to create a fully automated testing chain.

The goal is to apply every code change directly to all relevant vehicle variants. This significantly shortens development time and increases quality.

For the platform architecture, we are specifically developing the logical architecture to guarantee maximum flexibility across different hardware platforms. It is irrelevant whether we are looking at individual modules or entire driving functions here. For our customers, this means faster time to market, lower costs and a platform that will continue to work reliably in future.

**Thank you for taking the time and for this insightful interview.**