# INCHRON

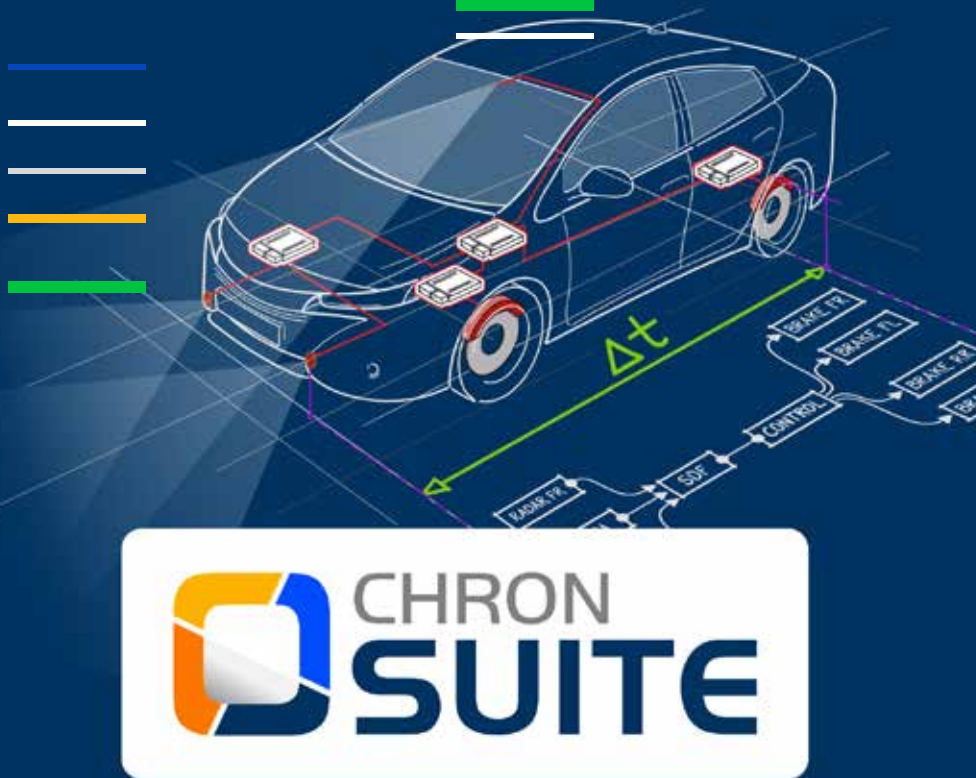## A passion for finding the right timing

SME in the spotlight

Dr. Ralf Münzenberger is CEO and one of the three co-founders of INCHRON, a German SME that originated as a university spin-off in 2003, when the customer value of the research became clear and the foundation for success was laid. "The name of the company is not incidental," Ralf explains. "It derives from the Greek God of Time, Chronos, so INCHRON means to be in time. Our purpose is therefore embedded in our name."

### Mastering system runtime performance

Initially, the customer base was automotive – OEMs and tier-1 and tier-2 suppliers. With more than 190 successful customer projects and many research projects in the locker, INCHRON has been inundated with offers of use cases and other insights from automotive industry experts and teams. Today, INCHRON is working intensively with a range of industry partners to understand how they can best benefit from the new methodologies and tools being explored. Along with Manager for Research Projects, Dr. Karsten Albers, Ralf provides an insightful look at the state-of-the-art methods and tools that enable system architects, developers and testers to fully master system runtime performance aspects over the entire real-time systems development life cycle as well as the role research projects play in the company's ongoing development.

### Superior results

"Our vision at the time we founded the company was that the increasing centrality of software in embedded systems – whether cars, trucks or aeroplanes – was not only here to stay but the needs for real-time analysis would become really dominant," Ralf notes. "You just have to think about a car braking system. It's an embedded system in which the electronic control unit has to respond to braking within a few milliseconds. What we provide is analysis of the timing behaviour of such systems, with methodologies that analyse the interaction between the various sensors, actuators and complex series of dataflows. Our solutions are

**INCHRON**
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geared towards enabling solid real-time design, paired with early proactive anticipation of real-time issues. This approach almost always delivers far superior results than just trying to fix real-time issues discovered by chance in later phases of the development life cycle."

**chronSUITE**
INCHRON's key product is the toolkit chronSUITE. The contained Simulation tool chronSIM supports embedded software development teams by ensuring that timing requirements are defined and then fulfilled, from the definition of the architecture through to system testing, finding and resolving timing issues long before final testing. Another product of INCRON's toolkit, chronVAL, allows the analysis of the real-time capability of safety-critical embedded systems using formal verification methods to calculate best- and worst-case response times, pre-emption times, end-to-end latencies, and resource utilisation. Sensitivity analysis detects timing bottlenecks and sporadic violations, reducing the overhead of time-consuming implementations, integrations and testing. This makes chronVAL a critical tool for engineers and architects to assess

and optimise design robustness and scalability. In general, timing analysis with chronSUITE is so important for flawless systems because timing failures often disguise themselves as functional issues.

**Happy customers**
"And for me," Ralf adds, "all this means happy customers. We want to bring benefits to our customers. That's also why research projects are important for us. There's a lot of change happening in our industry at the moment. Competition is becoming fiercer, and the amount of software is increasing exponentially. In the near future cars will be software-defined vehicles. So, if we are to remain relevant and bring value to our customers, we must be innovative, and generate innovations." Apart from the toolkit chronSUITE offered by INCHRON, the company provides consulting and training. Since innovative products are quicker to market than the higher education system is able to put such developments into their studies, it is part of INCHRON's remit to provide such training to its customers. "An essential part of this whole innovation process is the role of research projects like those in ITEA. This is why we participate."

**Research supports business strategy**
INCHRON is active in various publicly funded research projects, both on a domestic German level and on an international level. Indeed, research projects are central to the INCHRON business strategy as an SME to go forward, and Karsten explains why. "Research projects bring many open minds to the table. The diversity of participants and opportunity to exchange ideas and knowledge benefits everyone. For example, in the ITEA TIMMO-2-USE project, which finished in 2012, we were able to work together with users of our methodology – partners from around Europe – to increase reliability, safety, robustness and fault tolerance by a much higher degree, thereby enhancing and adapting real-time modelling and verification. This is simply not possible to do alone. It comes from different experts in different domains and application areas. Different problems are looked at from different angles and in this process innovation happens. Of course, you can't do this without the funding. The funding provides the opportunity, you could say, for innovation to take place."

**Positive going forward**
Another recently completed ITEA project in which INCHRON has been involved is PANORAMA, aimed at extending the scope and interoperability of current system level analysis approaches, particularly by enhancing the existing abstract meta-model AMALTHEA. "We have had a very positive experience of this collaboration, and we will no doubt be looking forward to future ITEA projects in which we can bring our expertise to bear and benefit from the knowledge of others. In line with our strategy, we will continue to be involved in such research projects."

**More information**
https://www.inchron.com/