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"Shaping Change"

The software-defined vehicle offers huge opportunities to implement new business models and new functions all the way up to ADAS/AD. This is being made possible by the use of modern concepts from the IT world and the application of machine learning or AI. Maintaining control over continuously increasing system complexity and the associated software requires suitable tools and development methods, as Christoph Hartung, Chairman of the Etas Board of Management, reports.

ATZelectronics _ On January 1, 2021 you moved from the business unit Connected Mobility Solutions at Bosch to the Etas board. Is this step linked to the formation of the new business unit Cross-Domain Computing Solutions at Bosch?

HARTUNG _ Domains that cover individual functions should not be considered separately from each other in the area of the software-defined vehicle. It is the comprehensive bringing together that really creates advantages. With regard to Bosch, I greatly welcome the pooling of activities in the Vehicle Domain Computing area with the formation of the new Cross-Domain Computing Solutions unit. Even though this step does not affect Etas directly, we can obviously follow-up on this quite well and support with our comprehensive portfolio of tools for software development. Accordingly, where the future topics of connected cars and full stack systems are concerned, they can be tackled together.

How does Etas fit into this matrix, is there an alignment, and what are the new tasks?

Christoph Hartung is an industrial engineer with a degree from the TH Karlsruhe and a Master in Computer Science from the University of Massachusetts. He assumed the position of Chairman of the Etas Board on January 1, 2021. After having held various positions at Mercedes-Benz and Volkswagen, Hartung came to Bosch in 2020.

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As a Bosch subsidiary, Etas acts autonomously as an independent supplier of development solutions. This enables us to offer solutions for the entire automotive industry independently of Bosch. This means that we have a much broader base and also have to perform in a highly competitive market. We have long been active in areas such as tooling, measurement, and HiL, as well as middleware and solutions for Continuous-X. From my point of view, there is currently another important topic in the market: new, powerful, Posix-based computer generations based on Autosar Adaptive that play a major role for Vehicle Domain Computing. We see considerable growth in this area.

"Middleware is the central enabler"

What is your share in the current developments in the area of automotive software?
We do not write code, neither for park pilots nor for battery management for example. We do however supply tool and middleware solutions to enable the implementation of these applications and the ability to run them on the control unit. In this respect, our focus is on efficiency and safety in development processes: we have understood how processes, methods, and tools need to change to be able to implement the previously mentioned complex systems in a vehicle, manage them and also support them over their entire life cycles. Development efficiency is a crucial factor in bringing new systems on the road. At the moment, the complexity of vehicle electronics is increasing rapidly. These systems can no longer be developed using classical methods. This is good news for us because mastering a high degree of complexity is our expertise.

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According to Christoph Hartung, a major topic on the market are new and powerful Posix-based computer generations, based on Autosar Adaptive

Do data-driven topics such as ADAS pose new challenges?
Absolutely. We are working on ADAS/AD in a large network of tier-1 suppliers and OEMs to determine what they need and how we can best support their development processes. These data-driven development flows have a clear basic framework: test vehicles drive as many test kilometers as possible and gather the data in the backend where it is simulated and validated, resulting in optimized algorithms being transferred back to the vehicle. Our tools and expertise in areas of measurement, calibration, and tool chains are requested to represent these development steps and to work together with the OEM to implement them for their vehicles. The specific difference between developing for the automotive sector and a pure IT world is definitely

that the tools are not exclusively digital, always require a bridge to the hardware world, and that they must simultaneously fulfill safety requirements.

Automated driving beyond SAE level 2 is still not in sight. What is your view on this?
To answer that, we need to look in both directions: where have we come from in the past few years, and where do we intend to go in the next two to five years. Four years ago, everyone predicted that we would be driving autonomously by the beginning of the 2020s; that was pure hype. Today, everyone is in the deep valley of disillusion; we now know what is really necessary to be able to drive in levels 3, 4, and even 5. I think that first of all the mainstream will be that OEMs concentrate on level 2+. Level 2+ will provide unbelievable support and will then gradually develop further. This will all go hand-in-hand with topics such as hands-free recognition and cabin monitoring that need to be solved. But this way, we will progress step-by-step towards level 3 and subsequently level 4 for constraint areas.

And beyond that?
Bosch is already working with partners to homologate level 3 systems for constraint areas such as a highway pilot and the like from 2021. I expect that over the next few years we will see premium class vehicles being equipped with this and that gradually, step-by-step, new functions will be introduced into vehicle series below them. There is currently a global race regarding level 4 and level 5 driving. However, there is neither a legal framework nor the necessary operating models describing how that can be achieved. I doubt therefore that we will see this being rolled out quickly. I do not see this being in regular operation for a long time. And yet, together with our customers, we will still keep a close eye on it.

The topic of automotive middleware is gaining importance in combination with centralized computing architectures. What is your view on this, also in terms of performance?
It is exactly as you say, middleware for microprocessor-based vehicle computers is the central enabler and one of the core technologies for AD and connectivity. The way in which middleware and the functions running on it are managed via the vehicle and the cloud is important. The question of who masters this the best will become the crucial and core aspect


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It is important how the middleware and the functions running on it are managed via the vehicle and the cloud; this will be the crucial, core issue and also the differentiator for OEMs, says Hartung

"The border between pre- and post-SOP is dissolving"

and also a differentiator for OEMs. Regarding the subject of overhead, it tends to depend upon where you come from. Middleware and clever resource management can be kept lean: in today's control units one is able to keep the space for the implementation of functions very small, also for cost reasons. Current systems in vehicles, due to the constraints, also have a very low overhead compared to classical IT. In any case, particularly with safety-critical applications, it must always be guaranteed via clear structures that the function can be executed rapidly and reliably in every situation. For this reason, we will not see functions such as brake assistants and ESP systems on Autosar-Adaptive-based software architectures any time soon in the future. In any case not in the next few years because they are highly integrated control units with software in close proximity to hardware. The aim is therefore to safely and efficiently connect classical embedded systems with IT applications.

How do you see the necessary structure for such an architecture?
If we look at the vehicle in detail, we see three levels. The functional control units for functions such as ESP, zone control units as hubs to integrate sensors and actuators, and the vehicle computer with clear structures and standards. In the latter two cases, software and hardware will always be independent of each other. We emulate exactly that with our middleware, the Vehicle Runtime Environment (VRTE).

Is there a need for action regarding standards, keyword Autosar?
We are approaching the point where we need to consider what should continue to be standardized. I am a supporter of open source structures because today's and tomorrow's complexity can no longer be solved by individual companies. Partnerships, open networks, and collaboration is required so that we can build the best solutions. In this regard, I welcome standards, clear structures, and a mutual understanding of how we can develop further over time. We need to work together in consortiums, as we did

in Autosar, to discuss possible standards and to subsequently implement them.

What is your opinion of dedicated AI-chips and dependencies?
If a company decides to settle upon a proprietary System-on-Chip (SoC) and a corresponding tool chain, then that is a free decision with all pros and cons. I see open standards as promising more success because the market needs to be as large as possible in order for them to develop further. There is always someone who adds another shovel load on top of open standards in order to differentiate themselves. Whether it is software-as-a-service or similar. Protectionism does not help industry in the long run and damages the overall development.

What about the topic of AI-software?
On the one hand, AI is just hype and on the other the new normal. The way in which self-learning systems are developing is becoming better and more dedicated. In any case, AI is not always AI. Artificial intelligence is also present when a vehicle learns how I travel, what I like to listen to, and actively adapts itself to my habits, for example charging behavior. I would even talk of AI for such functions, because the vehicle is adapting with the help of algorithms and learning how it can best support my daily mobility behavior. Such topics are imaginable. In addition, it will be crucial to develop today's development paths and tools using AI itself. This means, that this topic is a core element everywhere, and particularly so in ADAS development, and that we are contributing to it.

Is homologation increasingly in focus due to self-learning systems?
Absolutely and we see this not just in the context of AI, but generally of software. For example what happens if I roll out a new map for the engine controller or a new feature for the damper? How do I guarantee it, what about backward and forward compatibility? We are being confronted by a completely new perspective of how vehicles and software are operated in the future. A vehicle can therefore no longer be considered individually but continuously connected to a cloud structure. In this respect, the border between pre- and post-SOP is dissolving.


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There is a clear trend toward hardware independency because it is desired and reduces complexity, according to Hartung

How is the performance and learnability of the functions ensured?
By using specialized computer architectures from the SoC domain that can deliver the computing speeds required in the future. In addition, these systems have a totally specific setup. Upon start-up, there is a learning state with specific HAD boards from the backend, with a specific setup of how the sensor system creates its data fusion from the sensor sets, and clear rules of how the vehicle passes control to the driver when it reaches its limits. This means there are clear mechanisms describing how safety is guaranteed in the vehicle and for the corresponding application areas and boundaries of the assistance systems.
If we take a glance into the future, then a large, networked fleet will represent a core to ensure that from SOP onward, these systems will use AI and continuous improvement as well as model training, such as for a highway pilot, to become better and better. This is why it is so important that development activities are no longer limited to the desk but via constant validation in the field, making it necessary to handle large amounts of data intelligently via the cloud. The decisive factor are DevOps cycles in the field with vehicles that acquire and validate data before sending them to the development teams. This creates completely new development paradigms and complexity due to the platforms requiring management. This networking also means that a crucial role is played by a holistic security approach. We are in a good position here thanks to our subsidiary Escrypt.

Can or should software be designed SoC-specific or generically?
It depends very much on the use case and also on the domain. Wherever hardware accelerators are required for environment sensing or fusion, then they must be developed specifically. However, in infotainment today, we are used to integrate standard modules on arbitrary hardware. There is a clear trend toward hardware independency because this is desired and reduces complexity. A little like virtualization in IT centers ten or 15 years ago: first there were Linux computers, then the data center virtualization, then the cloud. Any other form is unimaginable today. The automotive industry is currently also experiencing this process of change. I am excited and looking forward to the challenges that lie ahead.

Christoph Hartung, many thanks for the interview.

INTERVIEW: Robert Unseld