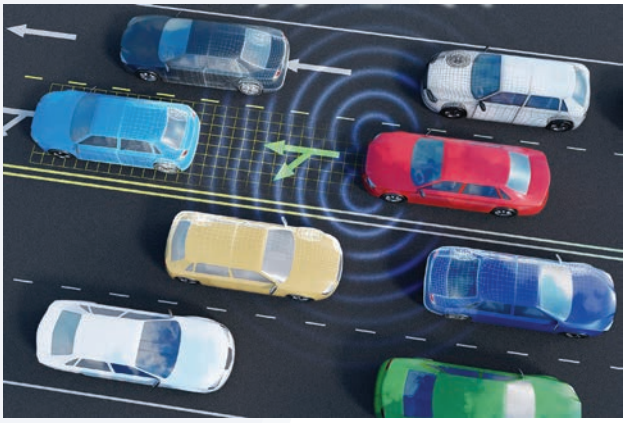
Connected and Autonomous Vehicles — A Thought Leader's Perspective

By *ANSYS Advantage* Staff

Professor Burkhard Goeschel

Professor Burkhard Goeschel is the former CTO of Magna, a former member of the BMW Management Board and the current head of the FIA Commission for Alternative Powertrain technologies. He has a passion for the automotive industry and motor sports. In a three-part interview series, he shares his views on the present and future of the automotive industry with Rob Harwood, ANSYS global industry director. This first part focuses on his insights into the new world of autonomous vehicles and connectivity.

Rob Harwood: The automotive industry is full of disruptive changes such as autonomy, connectivity and electrification. Do you see the role of simulation growing in importance?



Burkhard Goeschel: Without question. For example, in autonomous driving the vast number of use cases cannot be evaluated with hardware. It would require building hundreds of cars and driving millions of kilometers to see what is happening. This cannot be done. Simulation also plays a major role in reducing prototypes, increasing functional safety, and improving or checking the functionality of software solutions. This can only be done using simulation. Embedded software is so important now and automotive complexity is so great that there is no other solution. You have to look at the entire value chain, so simulation has to be employed throughout the process.

RH: Are autonomous vehicles, self-driving cars, automated driving — call it what you will — real or hype?

BG: As an engineer and a racer, I like driving, and I like the feedback. On the other hand, driving 120 kilometers at a time is boring, so I am open to the car doing the part I don't like. In addition, autonomous driving can improve safety, reduce fatalities, get you to your destination more conveniently, and make the journey more comfortable. So autonomy makes sense and will come, but for me there are other considerations.

RH: If we set the emotional aspect of driving aside, what do you see as some of the barriers to full deployment of autonomous vehicles?

BG: There are different stages of autonomous driving, with level 5 being a fully autonomous car. Legal issues must be solved in different countries, but there will be a solution in the end.

The complexity for level 5 autonomy in city traffic with pedestrians and everything else is very difficult to handle. This requires uncompromising functional safety. There should not be one unaddressed issue — not one. A fatality should not happen, and functional safety is really key.

An autonomous car is a highly complex system with a fairly new electronics architecture and new software that is not yet proven. How can you prove it? It would require billions of drivers over decades to evaluate your system for fully autonomous driving. So, we had to find a different solution to replace those billions of drivers over decades and do it in a short period of time. Simulation is the only way to make a reliable testing system for safety. There is no other solution.

RH: So, as autonomous vehicles become high-tech vehicles, the high-tech companies are aggressively pushing the development of these technologies. How are the more traditional automotive companies responding to that threat?

BG: In a fully autonomous vehicle, does a suspension system or steering wheel or other mechanical element play as big a role as it would if you are buying a Porsche or BMW today? I would say no. It just has to work, be convenient and safe. Different emotional expectations are being encouraged by big players from outside the automotive industry. This shift is dangerous for traditional automotive companies. Those big high-tech companies have a lot of money and can drive autonomy because it supports their business case by providing more time for car passengers to engage with screens and devices when they are in the car.

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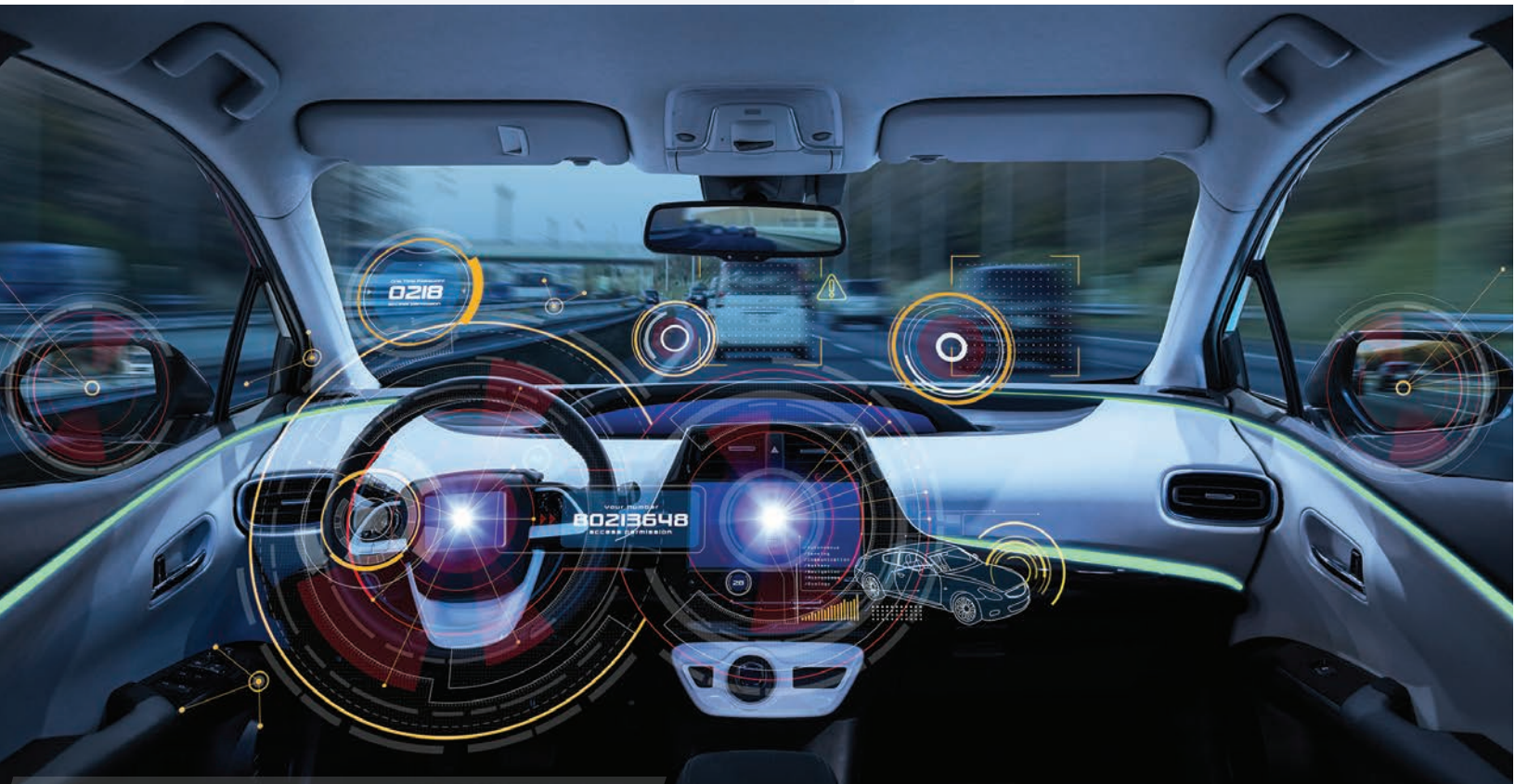

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RH: You are a motorsport guy and like the experience of driving. Do you ever see yourself using an autonomous vehicle?

BG: I come from a world where I still like driving. However, I would like it if I could shuttle to the city in a robo-taxi or robo-car or something like that, a situation where the emotional allure of driving isn't involved. For autonomous driving, the emotions have to come from another area, not the feedback from your steering wheel because the steering wheel is not even handled. So the interior of the car has to transmit new kinds of emotional engagement from displays and connectivity. Connectivity plays a major role because it transmits a lot of information into the vehicle, which equates to different emotions in the same way you may be emotionally coupled to your smartphone. Connectivity replaces the emotions generated by gripping the steering wheel and driving in a totally different way. That is where the big high-tech players come in, and it is a new world.

RH: As products become more connected, we hear in the news almost daily the latest cybersecurity issue. How do you see that being handled by connected cars?

BG: It is a difficult area that extends right down to the semiconductors. It is another problem to solve in which simulation has a major role to play. How can we detect if the electronics system is safe or not, if it is secure or not? These complex systems must be checked for security to detect their weak points. This cannot be done by thinking linearly anymore. It must be done using simulation. The whole value chain must be evaluated because cybersecurity can go into the car itself, but security may involve other systems that are based somewhere else. It's a severe problem.