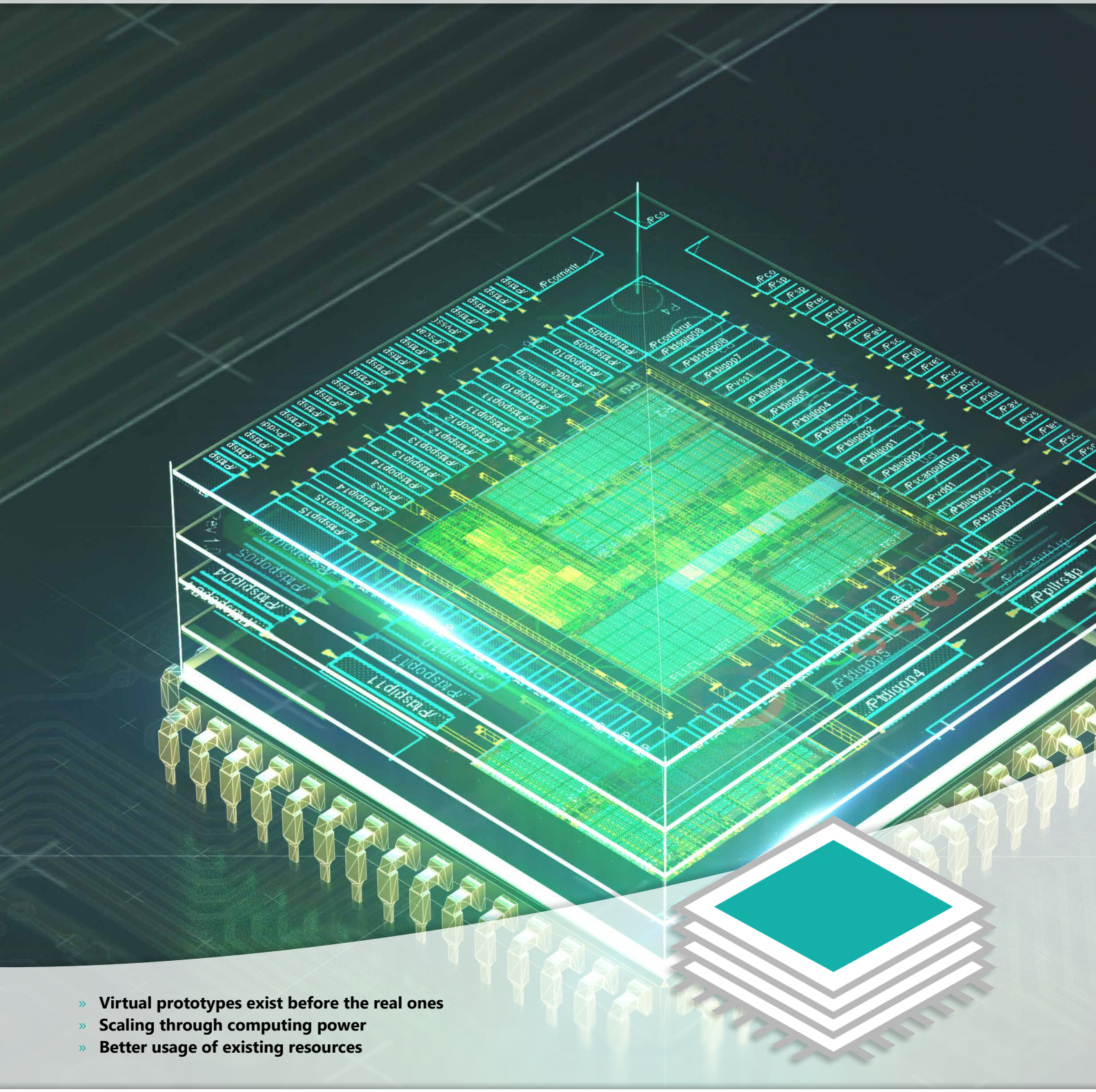
MicroNova
Software and Systems

vECU with MicroNova

Earlier and more in-depth testing through ECU virtualization



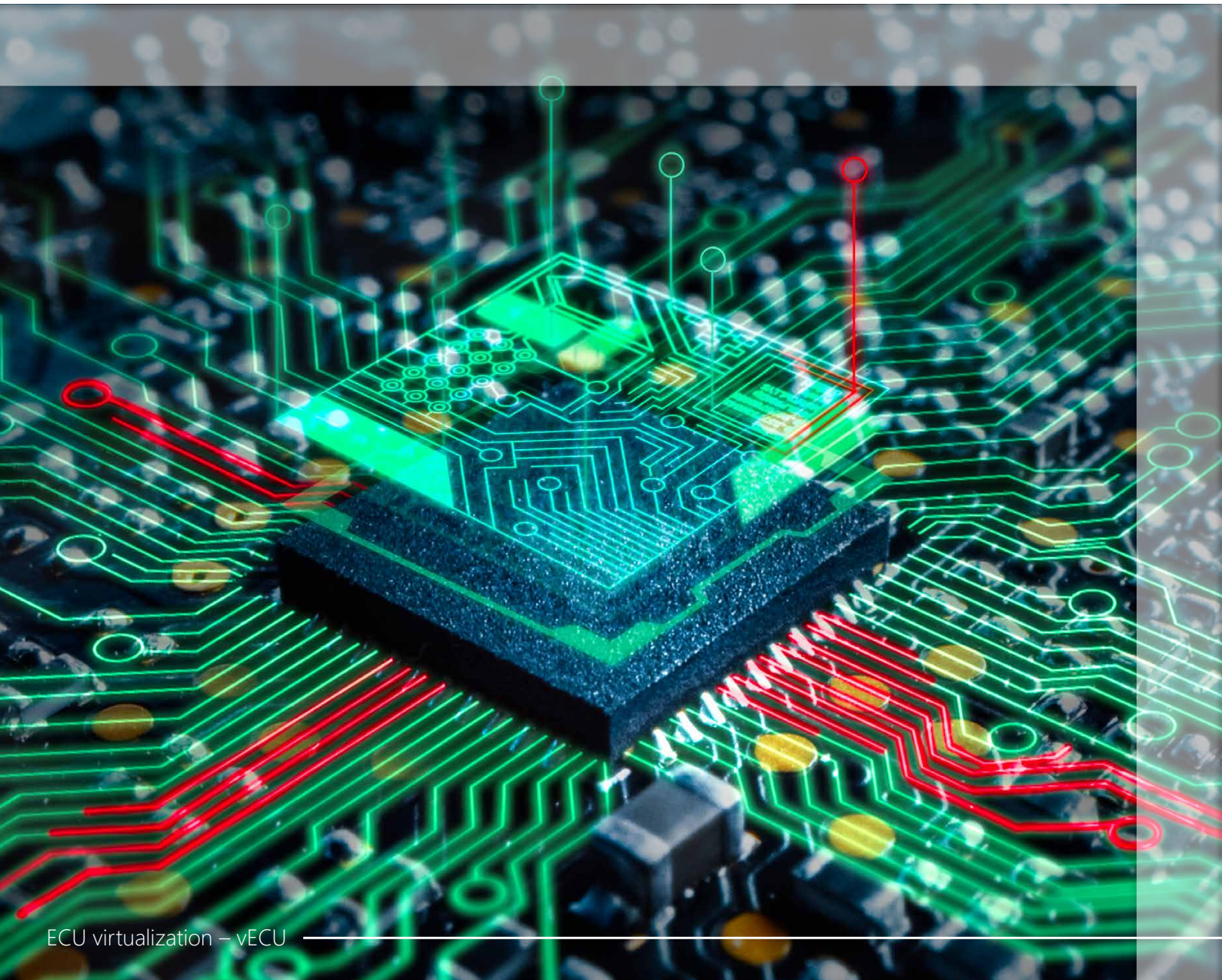
- **Virtual prototypes exist before the real ones**
- **Scaling through computing power**
- **Better usage of existing resources**

vECU with MicroNova

The growing number of assistance systems and more autonomous driving functions are making ECUs for modern vehicles increasingly complex. When these functions intervene in driving operations in some cases they can also entail safety-critical risks. Examples include independent braking, acceleration or steering when driving autonomously.

Such risks can be minimized by intensive testing at the earliest possible stage of development. However, this creates corresponding challenges for the testing processes. New ways of testing ECUs are needed to meet these demands. One of these ways is virtualization.

MicroNova supports companies in the development and operation of virtual ECUs. The early availability of a virtual prototype and the scalability of computing power result in massive productivity gains.



Advantages of virtual control units (vECU)

Optimal use of resources:
During virtualization, scaling is achieved through computing power and the use of data centers, rather than by adding more HiL systems or vehicles. This saves the capacities of test laboratories and test tracks without impacting testing depth. It also allows test resources to be shared: An airbag HiL cannot test an engine, but server 1 can take on tests from server 2.

Gain time:
Virtual prototypes exist before the real ones and developers can access a test bench before the first build. Furthermore, data from the design phase can be used to decide which variant is the best for a real build by testing virtual prototypes.

Drive innovation:
In cooperation with component manufacturers, jointly testing design changes to components directly in the virtual product results in simpler and cheaper tests. This helps achieve optimal coordination with the respective manufacturers and a deliberate positioning as an innovation driver.

Trusted tools:
The same developer tools can be used in the virtual ECU as on the HiL system or in the vehicle. The virtual ECU can also be easily integrated into the existing test automation solution. This provides great flexibility in test distribution (balancing) and accelerates the entire test process.

Original software:
As the vECU is a full simulation (not an emulation), the ECU software can be tested unmodified using the vECU test bench. All components of the hardware are reproduced on all levels by simulation models. Even the CPU on which the software runs is a simulation compatible with the original chip.

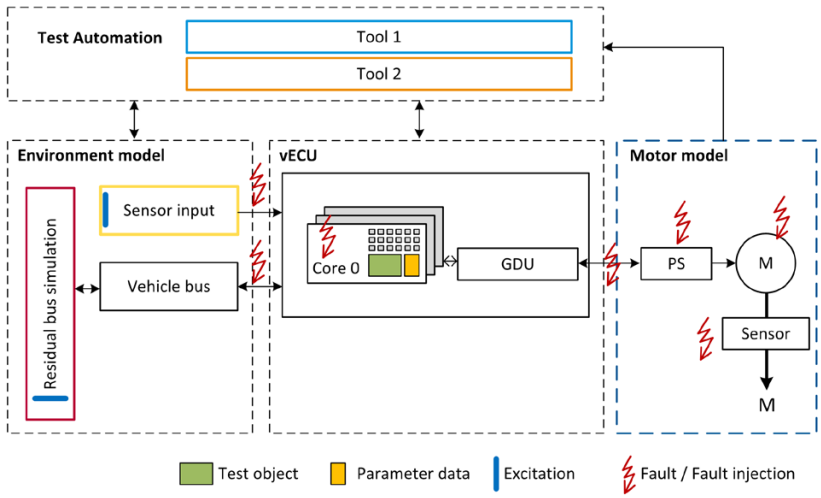
No special build needed:
Many SiL solutions require bypassing the software functions being investigated. Since the vECU uses the original compiled program, no stubbing is required to operate or re-measure the open paths of the software. Furthermore, there is no need for cross-compiling, as the original processor runs as a simulation.

Insight into the device under test at any depth:
Access is achieved using tools from software development. For example, there are interfaces to common debugging tools with which tests can be carried out at the operation level.

ECU software development process according to ASPICE:
As the code remains unchanged even in the event of manipulation, it is not necessary to reconsider the code for ISO assessments. Qualified products are used when setting up the tool landscape for the virtual ECU in order to simplify later qualification of the complete toolchain.

Still executable years later:
In the event of a fault, it must be possible to prove, even after 15 years, that sufficient measures were taken during development to avoid this fault and that these measures were tested. This means that if a brake or steering system or similar fails, the old test system must be brought back out and the test carried out again. Not a problem in the purely virtual world: Even today, the respective test system is already being used as a virtually encapsulated system. This means that it can be archived and even after many years, non or only minor adjustments are needed to put it back into operation.

How it works



Overview of virtual test bench with test automation.

Our expertise

The experts at MicroNova Consulting provide companies with comprehensive support in operating virtual ECUs. With their know-how they help manufacturers and suppliers carry out ASIL-D relevant tests according to the requirements of ISO 26262.

- High level of tool competence
- Years of experience in commissioning
- In-depth understanding of interrelations
- Modeling
- Sensors
- Environment
- Integrated circuits

Find out more at: www.micronova.de/en/virtual-ECU

Virtualization of HiL systems with NovaCarts Virtual

Another way to optimize test processes using virtualization is to use Connected Mixed Reality (CMR) environments. Such test environments enable a complete virtual simulation in the cloud in addition to a complete real vehicle setup with ECUs – or a mix of both environments. This focuses on the virtualization of the HiL system. In order to run real-time simulations in a local cloud and to control hardware components via real-time Ethernet, MicroNova has made the components of the NovaCarts HiL simulation platform cloud-capable. This real-time simulation software for use in CMR environments is called „NovaCarts Virtual“ and enables work with classic HiL setups as well as fully virtual simulations in a cloud.

Find out more at: www.micronova.de/en/NovaCartsVirtual

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