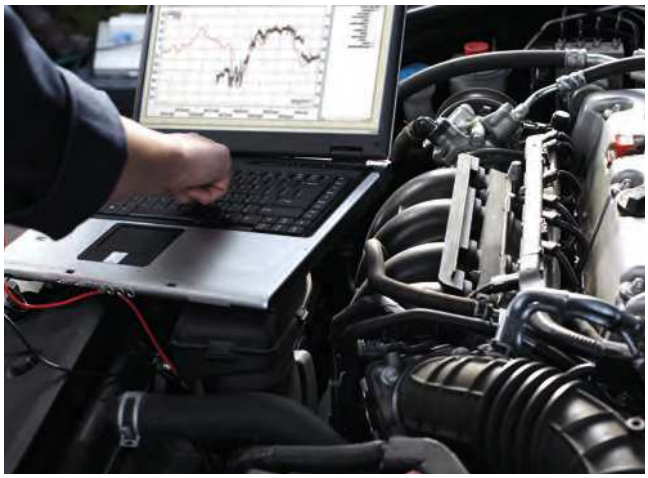
Holistic assurance and verification

A complete service provider with expertise in software analysis and verification for the development of connected vehicle technologies

Automotive manufacturers are facing increasing pressure to shorten times to market as they develop more vehicle models. Meanwhile, the growing number of electronic components in vehicles is presenting new demands for solutions in the field of vehicle, software and component testing. Formel D, as an experienced partner in the automotive industry, caters for these needs through its services in virtual and real-world testing.

There is also a demand for increasingly complex test and analysis methods in all phases of the vehicle lifetime, from product development to production and aftersales. Formel D's experts can decide in each case which method and means of testing should be used. "Basically, the further a product has been developed, the more realistic the test models we choose," explains Marcel Klehr, director of sales at Formel D. "In the run-up to each project, our detailed procedures are defined in close coordination with the customer. We are able to use our extensive know-how and years of experience here."

System complexity in the vehicle structure has grown dynamically in the past few years and continues to do so. In conjunction with considerably shortened development times until SOP (start of production), increasing global competition and rising material costs,



this forces manufacturers to investigate new test methods and use virtual simulation more extensively. Nowadays computer programs can provide thousands of hours of testing and computation time, making the development process as efficient as possible.

CAE and CAD programs are now an indispensable tool in vehicle development. Their field of application is virtually unlimited and includes several aspects such as vehicle design, component arrangement, and optimization of installation space. Material fatigue and wear are of utmost importance, too.

Formel D also supports clients in the process of cost optimization of components and systems using digital mock-ups (DMUs), which replace costly physical prototypes. Realistic product simulation maps all the relevant characteristics and functions, and provides a solid basis for engineering changes and decisions.

"DMU-based tests link product development and aftersales," Klehr explains. "Virtual prototype testing is used for the optimization of the overall vehicle as well as components and subsystems. For example, the positioning of a module in the engine compartment can be crucial for material demands such as weight, wall thickness and temperature resistance. This enables prediction of a product's lifetime and ultimately, the aftermarket demand. This is very important information. Numerous factors come together at this point." For this reason, it is crucial to obtain an overall view of the vehicle through DMU tests, which enable early optimization in vehicle development.

Manufacturers are also increasingly developing new ADAS to relieve the driver in demanding traffic scenarios. Many of these are based on cameras and sensors installed in the vehicle. The precise, reliable functioning of these systems is of high priority for OEMs and their suppliers.

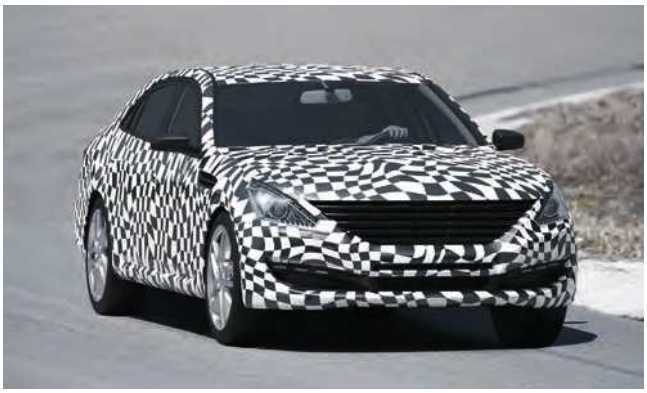
Formel D supports customers in the development and implementation of software-based assistance systems, and today's vehicles are equipped with a network of different electronic control units. Extensive tests have to be conducted in order to ensure that the network of ECUs and the software are functioning perfectly.

"In code review, we operate via the 'two pairs of eyes' principle and analyze every detail of the source code, which contains the complex commands for the ECU," says Klehr. "Software verification is carried out in several phases, partly at test facilities which simulate the interaction between different control units during flashing in a vehicle-specific way." If discrepancies become evident during the analysis, IT experts can establish the necessary corrective measures and directly implement them in coordination with the client.

In terms of real-life testing for both hardware

and software, Formel D offers full support, from the camouflaging of a prototype to professional test driving. It also has test centers equipped with cutting-edge technology.

"We can test camera-based sign recognition software and sensor-assisted distance warning systems in pre-series passenger cars. Software and hardware verification automatically overlap here," Klehr explains. "Our experienced test pilots follow detailed protocols on test drives, and this enables them to cover several test activities at the same time." For example, hardware testing of safety-relevant components includes both belt and brake testing simultaneously.



Upon request, Formel D can oversee the entire camouflage process, offering its expertise in prototype logistics, from warehousing through to the official documented scrapping process

Comfort-focused features are also of increasing importance to OEMs. These features are crucial for the quality perception of the vehicle and overall customer satisfaction. In the course of a vehicle's lifetime, numerous system updates are usually carried out at service intervals. In this way, software verification carried out during vehicle development also has an effect on aftersales processes.

"Early on, while conducting virtual tests in vehicle development, we take customer-specific requirements of the IT architecture into account," Klehr explains. "This is how we make sure that it matches the existing system interfaces during later servicing." Only correctly functioning software enables complex flash processes of control units. The workshop updates data, which can partly be experienced by the customer, such as new menu items in the case of navigation software. At the same time, system updates are an important factor for the functioning and value retention of a vehicle. Updates of this kind ensure customers' long-term satisfaction, even years after purchase, and help create brand loyalty. ❮