

Great Wall Motors: Electric and hybrid vehicles developed with dSPACE TargetLink

The Versatile Electric

For more than ten years, Great Wall Motors (GWM) has focused on new drive technologies as one of their development paths and operates development and test facilities for electric and hybrid vehicles.

Today, the GWM brand portfolio includes innovative production vehicles such as the Wey P8 plug-in hybrid and the Ora R1 electric car. During development, the company used the production code generator dSPACE TargetLink as well as other tools from the TargetLink Ecosystem.





Picture credit: © Great Wall Motors

Electric and hybrid vehicles and their charging infrastructure have numerous safety-critical functionalities that must be developed in accordance with safety requirements and validated prior to series production. The safety-critical functionalities include battery management to prevent overcharging and overheating, torque control, braking and recuperation, the safety of the electrified steering systems, and charging station management with voltage control. To develop and validate the associated ECU software functions and the generated production code, GWM uses a sophisticated tool environment in which numerous specialized tools are interwoven.

Coordinated Tool Environment

At Great Wall Motors, most of the software for electric and hybrid drives is developed centrally and then integrated into the respective vehicles of

the GWM brands. At GWM, work in distributed teams plays a major role. These teams usually consist of up to 20 employees. We use IBM® Rational® DOORS® to manage the complex requirements. We have also used the dSPACE TargetLink production code generator in the New Energy division at GWM since 2015 and have implemented it successfully over ten production projects. The tool has also proved its worth in distributed teams. A special team for functional safety ensures that all safety-relevant requirements are met, including general standards and norms as well as GWM-specific guidelines. Based on Simulink®/Stateflow®, function modeling is now carried out directly in TargetLink. In TargetLink, GWM intensively use the AUTOSAR and simulation functionalities (MIL, SIL) as well as the TargetLink Data Dictionary. We also introduced the dSPACE SystemDesk architecture

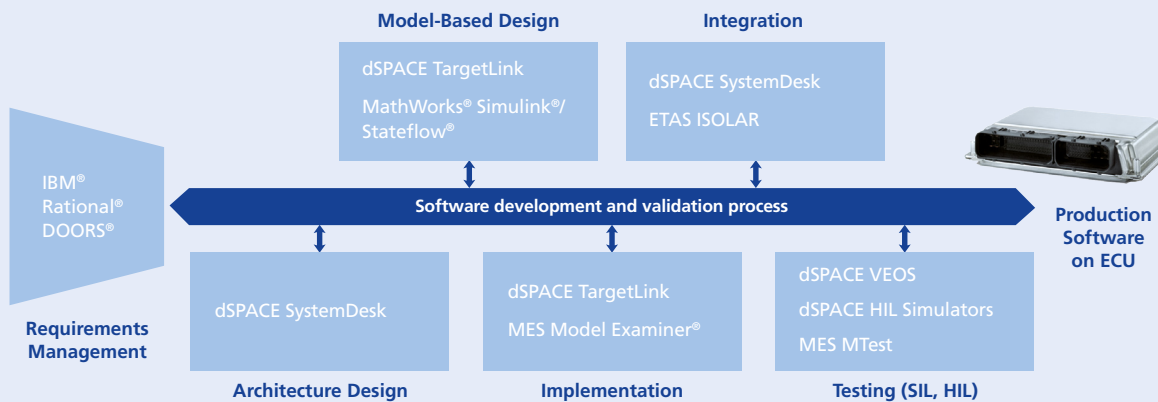
tool into our work and use it to model and integrate our AUTOSAR architectures. With SystemDesk, we can perform efficient AUTOSAR round trips in TargetLink. Virtual ECUs (V-ECUs) generated in SystemDesk can be tested very early on with the dSPACE VEOS simulation software, long before performing the HIL tests. Compliance with GWM-specific modeling guidelines is checked with the MES Model Examiner®, while MES MTest is used as a test management tool for the requirements-based testing of Simulink® and TargetLink models. After the software is implemented on the ECU, it is validated by means of hardware-in-the-loop (HIL) simulation on dSPACE HIL simulators.

Optimized Production Code

We evaluated the major production code generators and, based on these benchmarks, finally decided >>

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Xuechen Zang, Great Wall Motors



Using dSPACE TargetLink, tools from the TargetLink Ecosystem, and other tools, GWM is developing and validating software for electric and hybrid vehicles.

on dSPACE TargetLink in March 2015, because TargetLink proved to be particularly powerful and ideal for our requirements. Since then, TargetLink has been an integral part of our development process. Thanks to the quick start-up assistance from our dSPACE contacts, we were able to set up the relevant process very quickly and start productive work with the new tool after only a short time. Today, we use TargetLink for almost all components of the ECU application software. From the very beginning, we were extremely pleased with the high quality and efficiency of the generated code, its excellent readability, and the stability of TargetLink in continuous operation and interaction with the other tools. The TargetLink Data

Dictionary, which we use in all our projects, has proven to be very practical. For example, we use the TargetLink Data Dictionary to manage interface, measurement, and calibration variables, and also use it to generate variable descriptions in A2L format. The TargetLink API allows us to use our own scripts to accompany the process, for example, to handle library functions and add information during A2L generation.

Validated Software in Series Use

Our Wey P8 series vehicle, a plug-in hybrid with four-wheel drive, and the Ora R1 electric car launched at the end of 2018, which is specially designed for city traffic, are examples of software developed and validated with

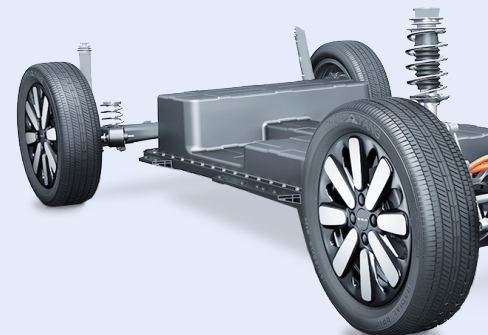
the above-mentioned tool environment in series production. In addition to the fuel efficiency and emission reduction of a hybrid drive, the Wey P8 offers plenty of driving pleasure by combining an all-wheel drive with an alternative combustion/electric drive. The Ora models all use the same intelligent New Energy Platform (hardware/software), from which numerous model variants can be derived. It is the first exclusive platform for electric vehicles from China.

Outlook

We plan to develop even more software in-house in the future, for which we will continue to use TargetLink and the tool environment described above. AUTOSAR and the devel-



Runs on electricity: Ora R1.



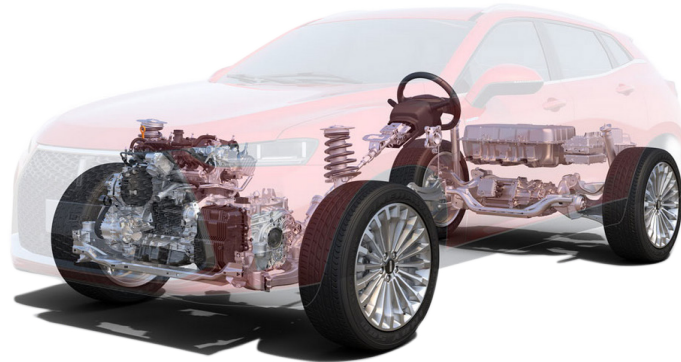


Picture credit: © Great Wall Motors

Top and right: The powerful plug-in hybrid Wey P8.

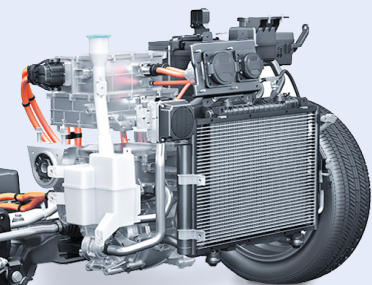
opment of safety-critical functionalities will play an even greater role in the future. Specifically for this, TargetLink offers the right prerequisites, such as direct, native support of the AUTOSAR standard and certification for software development according to ISO 26262, ISO 25119, and IEC 61508. ■

Xuechen Zang, Hangdi Yao,
Great Wall Motors



“TargetLink makes it easy for us to develop safety-critical systems thanks to its certification for software development according to ISO 26262, ISO 25119, and IEC 61508.”

Hangdi Yao, Great Wall Motors



Xuechen Zang

Xuechen Zang is a software development engineer at Great Wall Motors, China.



Hangdi Yao

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