

AUTOSAR meets functional safety

ETAS helps Beijing New Energy Automobile Co. (BJEV) achieve its goals

AUTOSAR is continuing to expand in the automotive market as a reference standard for developing complete ECU software stacks. The benefits of higher efficiency, lower time to market, and full feature coverage are becoming increasingly evident in many areas as AUTOSAR becomes a more mature, all-around standard for supporting the development of embedded applications - including the fast growing electric vehicle (EV) domain. BJEV choses ETAS to introduce AUTOSAR for their ECUs.



Who is BJEV

Beijing New Energy Automobile Co., Ltd. (BJEV) – a subsidiary of Beijing Automotive Group Co., Ltd. – is China's biggest electric vehicle maker. The company produced over 100,000 electric vehicles in 2017, a figure that is set to rise to over 230,000 in the near future. As a new energy vehicle OEM, BJEV plays a key role in the Chinese government's strategic plans, including its "Made in China 2025" state-led industrial policy.

The challenge

The automotive industry has undergone some major changes in recent years driven by a number of factors. One key aspect has been the introduction of functional safety standards, such as ISO 26262 for passenger cars and ISO 25119 for agricultural machinery. These standards have had a significant impact on software development processes and practices.

The task facing BJEV was to develop ECUs such as the Motor Control Unit (MCU), Vehicle Control Unit (VCU) and Battery Management System (BMS) and to certify them as ASIL-C compliant in accordance with the ISO 26262 standard. This raised some challenging issues due to the simultaneous introduction of multiple elements of complexity at the same time – including AUTOSAR – and the implementation of various safety measures.

In regard to safety, the biggest challenge was the implementation of efficient mechanisms to support the "freedom of interference concept." This concept allows the coexistence of safety-related and non-safety-related software functions in the same execution context (e. g. one ECU). Typical strategies to implement freedom of interference include:

- Memory protection to isolate safety-related systems from non-safety-related systems
- Data corruption protection such as end-to-end signatures to detect if data contents are valid and received in the right sequence
- Sequential program execution using program flow monitoring functions to detect any unexpected sequence execution

Achieving these goals required clear actions and a meticulous, detailed project management approach in a range of areas. ETAS provided support in the form of consulting and engineering services, allowing BJEV to focus on their key innovation activities.

Project steps

This project comprised three steps. The first step was to build up AUTOSAR competence at BJEV with a focus on VCU development. During this phase, ETAS supported the customer in various ways, including training, engineering with the RTA Basic Software (RTA-BSW) Release Package, Microcontroller Abstraction Layer (MCAL/CDD) integration, fine tuning of Basic Software (BSW) configurations, on-site debugging, and Software Component (SWC) integration consulting. This step played a crucial role in helping BJEV to envision a tangible AUTOSAR-based future for ECUs that would improve the efficiency and quality of the final product.

In the second step BJEV migrated AUTOSAR architecture to BMS and MCU. This involved several tasks, including the porting of RTA-OS (operating system) to TI TMS570 and IFX TC234 microcontrollers.

The third step involved of a joint effort to obtain functional safety certification for all the ECU software stacks with TÜV, BJEV, and ETAS working together to achieve ASIL-C compliance. ETAS provided a holistic solution to BJEV to meet the requirements under ISO 26262, including functional safety qualification, safety manuals, safety cases, assessment reports, and safety reviews.

Conclusion

As automotive norms and regulations evolve and the market becomes more restrictive, complex and standards-driven, OEMs are faced with increasing challenges on the road to developing innovative and successful cars. The key to success includes an ability to keep costs to a reasonable level and, despite increased complexity, to reduce time to market. ETAS provided the right products and expertise to enable BJEV to achieve its goals, minimising the development work involved by deploying off-the-shelf ETAS AUTOSAR components and state-of-the-art techniques that ensured full ISO 26262 ASIL-C compliance.

"The ETAS AUTOSAR solution is a big step forward for us," says Yu Jun, Deputy Department Director of Strategy Development at BJEV. "It gives us a solid basis that allows us to focus on our innovation activities. The collaboration and expert support provided by the ETAS team was instrumental to the success of this project."

Authors

Tang Yi is Hub Manager for RTA Solutions at ETAS in Shanghai, China. **Daniele Garofalo** is Global Head of Product Management for RTA Solutions at ETAS Ltd. in York, United Kingdom.