



# Rapid

## AUTOSAR

MicroAutoBox II as a powerful,  
AUTOSAR-capable prototyping  
and development platform



With its new RTI AUTOSAR Blockset 2.0, dSPACE now supports the execution of entire ECU applications on MicroAutoBox II. The result: many more possibilities and higher productivity than in ECU-based approaches.

**E**fficient processes are essential for the success of production-oriented development projects. One important component is the seamless transition between rapid control prototyping (RCP) and AUTOSAR-based production software development. For example, developers want to reuse existing software components (SWCs) to design new controllers in MATLAB®/Simulink®, test new control algorithms in the ECU software, or validate the complete application software of an ECU as early as possible. This makes AUTOSAR support in the early development stages more important every day. But the technical complexity of AUTOSAR makes it difficult for function developers to use the standard. Furthermore, the common AUTOSAR tools are especially geared towards software experts. The RTI AUTOSAR Blockset 2.0 and MicroAutoBox II, dSPACE's compact rapid control prototyping system, bridge the gap between model-based control design and AUTOSAR production software, making it easier for function developers to master the complex matter.

#### Easy Software Reuse

Often, new control algorithms build on existing functions. In the past, if these functions did not exist as Simulink or TargetLink® models but as production-ready C code, reusing them for model-based devel-

opment often entailed a great deal of work. Either the models had to be developed afterwards, which is time-consuming, or the C code was adapted for Simulink with customer-specific, and therefore cost-intensive, solutions. The RTI AUTOSAR Blockset 2.0 makes it possible to import software components that were developed according to the AUTOSAR standard into Simulink without additional effort. The software components can also be integrated in new controller models.

#### Early Start for Prototyping and Testing

Testing new control strategies together with the ECU software, and testing and evaluating the controller behavior in combination with the real plant model are important components of the development process and often take place in the real vehicle. However, the first prototypes of new ECUs often become available only months after the start of development, and at first only in limited numbers. Moreover, not all basic software (BSW) modules are completely implemented and tested from the beginning, such as I/O drivers for new sensors and actuators. These factors can significantly delay the tests of new control strategies. The RTI AUTOSAR Blockset 2.0 lets developers use MicroAutoBox II as a universal AUTOSAR-based development ECU, making prototyping >>

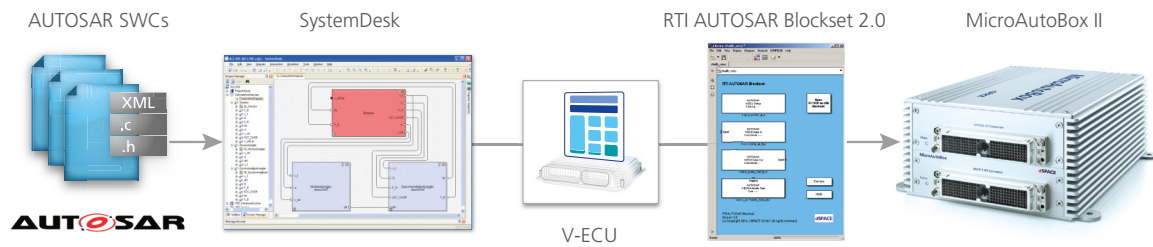


Figure 1: AUTOSAR-based workflow for rapid control prototyping.

## MicroAutoBox II and AUTOSAR

MicroAutoBox II provides a comprehensive AUTOSAR real-time operating system with low I/O latencies, similar to those of production ECUs. It supports AUTOSAR versions 3.x and 4.x. Compliance with AUTOSAR OS Scalability Class 1 ensures a high degree of compatibility with the AUTOSAR standard. In addition, the most important basic software services, such as the ECU State Manager (EcuM), NVRAM Manager (NvM), and AUTOSAR CAN Stack, are supported. AUTOSAR Software Components can therefore be used in a realistic AUTOSAR environment for rapid control prototyping, benchmarking, and tests, long before the first prototypes of a production ECU become available.

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### Flexible AUTOSAR Development Platform

One main goal of AUTOSAR is the easy integration of software components from different suppliers into one ECU software. Suppliers are facing the challenge of extending their functionalities by customer-specific functions and testing them under customer-specific operating conditions. With MicroAutoBox II as an AUTOSAR-capable development system, suppliers can modify their software components very early and test them efficiently. They do not have to wait for prototypes of the production ECU, nor do they have to know the project-specific development environment. The many parameters and their complex dependencies make configuring the BSW in the traditional production tools cumbersome and susceptible to errors. The model-based approach, in contrast, makes configuring the operating system and I/O of MicroAutoBox II intuitive, and customer-specific actuators and sensors can be connected fast and flexibly. Customer-specific test environments can therefore be set up with minimum effort. This lets suppliers develop prototype

solutions for a customer independently of the customer's tools.

### Seamless Tool Chain

In addition to the RTI AUTOSAR Blockset 2.0 and MicroAutoBox II, dSPACE provides powerful tools for model-based software development, software integration, and offline validation: TargetLink, SystemDesk®, and VEOS®. Together, these tools cover all phases of function and software development, from designing new control functions to the software architecture and software integration, from PC-based simulation to rapid control prototyping and in-vehicle testing. The tools also allow for a seamless development process (figures 1 and 2). The experiment software ControlDesk® Next Generation completes the tool chain. It lets developers use the same measurement and calibration data and experiment layouts for all the platforms up to the production ECU, reducing the adaptation effort. The link between software development and subsequent prototyping and testing activities is dSPACE SystemDesk. With SystemDesk, developers can import AUTOSAR SWCs and connect them to build application software. SWCs can come from the production code generator TargetLink or from other AUTOSAR tools. Engineers can also

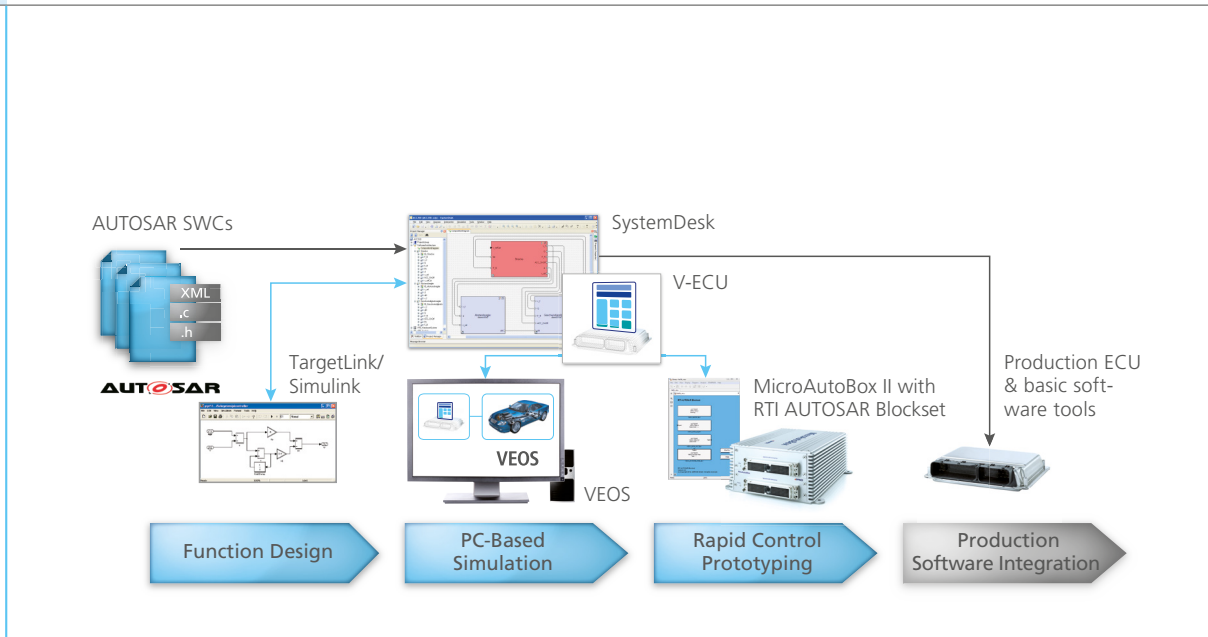


Figure 2: Seamless dSPACE tool chain for function design, rapid control prototyping, and testing.

## dSPACE's seamless AUTOSAR tool chain improves productivity in the development process.

use SystemDesk to configure the AUTOSAR operating system, basic software, and run-time environment (RTE) of the target system or use existing configurations from other AUTOSAR tools. Based on this information, the SystemDesk V-ECU Generation Module can be used to generate virtual ECU (V-ECU) software that can be used with the PC-based simulation platform VEOS for offline validation and the RTI AUTOSAR Blockset 2.0 for rapid control prototyping. In both cases, the V-ECU can be enhanced with additional functions based on Simulink models.

### Maximum Test Coverage

While the functional characteristics of a V-ECU can be validated efficiently via offline simulation with VEOS, the same V-ECU can be executed on MicroAutoBox II together with the physical plant by using the RTI AUTOSAR Blockset 2.0. Developers can thus validate real-time-specific parts of the software behavior, and evaluate and test the V-ECU under realistic operating conditions, even

in the vehicle. Functional and non-functional characteristics can therefore be thoroughly validated and a high test coverage can be achieved.

### Conclusion

The new RTI AUTOSAR Blockset 2.0 makes MicroAutoBox II a universal, real-time-capable AUTOSAR development system for production-oriented, model-based development and testing. Its possibilities and productivity by far surpass those of ECU-based development processes. ■

## And Without AUTOSAR?

What if your ECU software is not based on AUTOSAR? You can also set up seamless tool chains and processes for non-AUTOSAR software. For more information please contact our experts by e-mail to [rcp@dSPACE.de](mailto:rcp@dSPACE.de).



MicroAutoBox II: Universal, real-time-capable development system with the extensions Embedded PC (center) and the RapidPro SC Unit, which provides signal conditioning (right).