

Hand in Hand

- **SystemDesk and TargetLink**
- **AUTOSAR-compliant development at the system level and function level**
- **Efficient work methods in the production development process**

The aim of the AUTOSAR initiative is to considerably improve the development process for electronic control units (ECUs). Achieving this goal requires efficient interaction between the model-based procedure at the system level introduced in AUTOSAR and the established model-based development at the function level. The system design tool SystemDesk and the production code generator TargetLink, both from dSPACE, complement each other perfectly to provide an efficient model-based method during the production development process.

In the development of AUTOSAR-compliant application software for an ECU, SystemDesk and TargetLink come into play in different phases. The software architecture of an ECU can be specified by means of software components in SystemDesk. TargetLink's strengths lie in filling these components with function models and generating highly efficient production code. As described below, interaction between the two tools can be initiated from both sides.

Architecture-Driven Development

This approach uses the methods proposed in AUTOSAR. It begins by defining an ECU's software architecture at a very early stage in the development process. Using SystemDesk, the architecture is modeled in the form of software components (SWCs) according to the AUTOSAR standard. This also includes specifications of the interfaces and connections between components. Thus, interfaces are compatible from the start, and all the signals required from other SWCs are available.

The descriptions of individual SWCs can be used subsequently together with the TargetLink AUTOSAR Module to automatically generate an initial model frame for

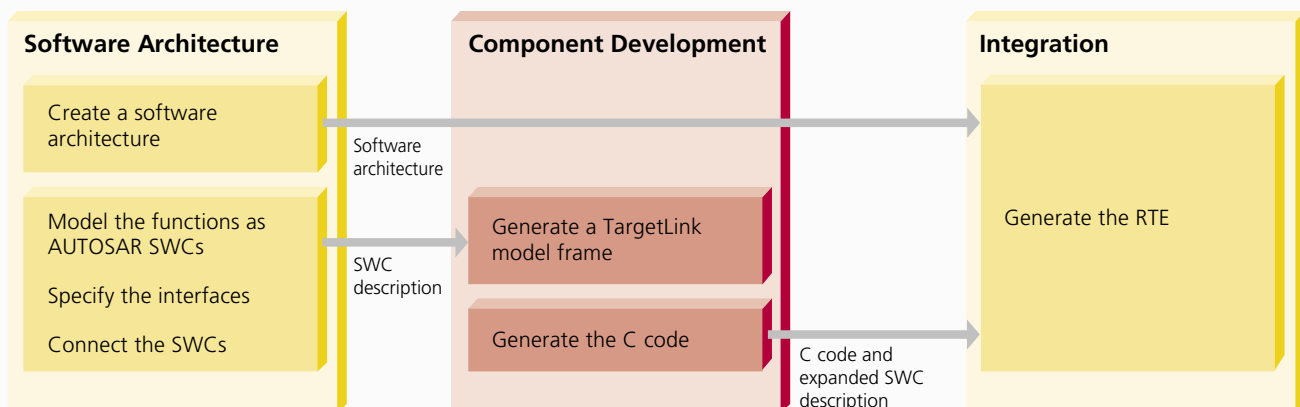
developing a new function. Thus, the definitions that were previously prepared in SystemDesk are consistently transferred to TargetLink as interface blocks. As soon as the behavior of the SWCs has been defined by adding the actual controller model to the model frame, AUTOSAR-compatible C code and an extended SWC description can be generated with TargetLink. The results can be transferred back to SystemDesk, where they are checked for consistency and are available for later software integration, including the generation of what is called the Run-Time Environment (RTE).

This sequence can be repeated as required. To manage the AUTOSAR data within TargetLink, it is placed in the dSPACE Data Dictionary, where it can be either imported directly or compared and combined with the data in the existing data dictionary. The imported data is then linked to the actual TargetLink AUTOSAR model.

Function-Driven Development

If an existing function model has to be used in a new AUTOSAR project, the interaction described above can also be initiated from the function view. If the function

▼ *Workflow for architecture-driven development.*

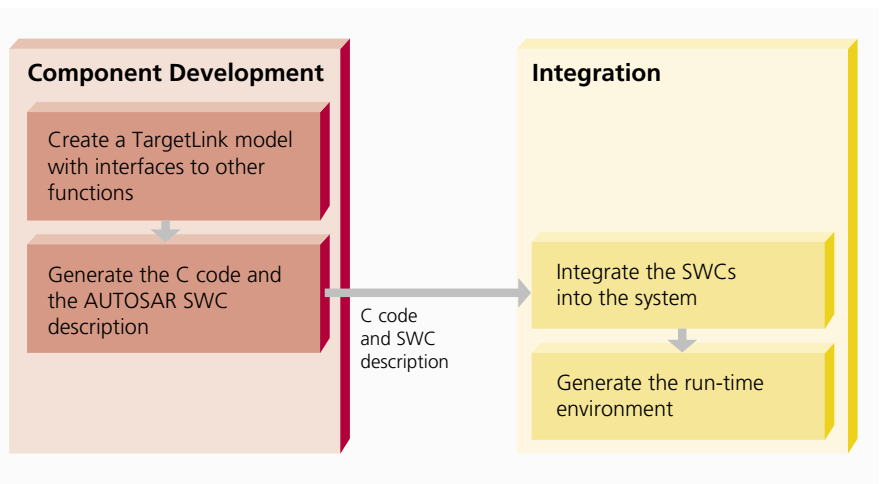


is available in the form of a TargetLink model, it can be migrated by using the TargetLink AUTOSAR Module. The associated data dictionary is used to specify the attributes that each AUTOSAR SWC requires. When the model has been completed, TargetLink automatically generates a component description in the form of an AUTOSAR XML file, in addition to generating the AUTOSAR-compliant C code.

This description can be imported into SystemDesk as a new SWC. It can then be integrated into an overall system by linking it to other components. The interfaces can be checked for compatibility. If they are not compatible, for example because deviating fixed-point scaling was used, the component developers have to adjust the interfaces. The RTE cannot be generated until all SWCs are correctly connected.

Interaction between SystemDesk and TargetLink

The iterative nature of the procedure should be emphasized here: When the software architect changes the SystemDesk model, he or she also creates new versions of the SWC descriptions for the responsible developer. Parts that are different from the old data are indicated



▲ Workflow for function-driven development.

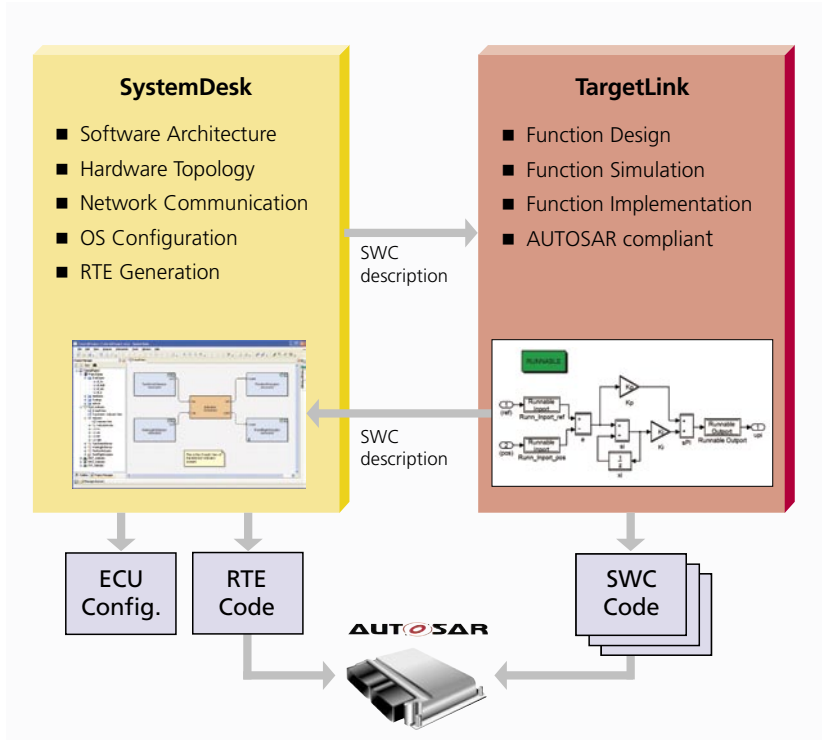
in the dSPACE Data Dictionary Manager. If a developer then creates a new version of the SWC, the SystemDesk model can be updated without important information being lost. For example, the connections between the components and their properties are preserved.

Summary

The system design tool SystemDesk and the production code generator TargetLink from dSPACE are two coordinated tools that allow fast iteration between system

design and component-level function development. SystemDesk and TargetLink support an architecture-driven procedure and also allow previously created function models to be integrated at system level. SystemDesk and TargetLink thus pave the way for the efficient development of AUTOSAR-compliant ECUs.

Further information on SystemDesk and TargetLink: www.dspace.com



▲ SystemDesk and TargetLink support fast iterations between system design and component development.