

# AUTOSAR Central



Moving from AUTOSAR 3.x to AUTOSAR 4.x

# Change with Ease



The AUTOSAR standard stands for safety and for exchanging and reusing software components. dSPACE offers comprehensive support for switching up from AUTOSAR 3 to AUTOSAR 4.

**A**UTOSAR 4 provides many more functions than AUTOSAR 3 in areas such as functional safety, multicore applications, and describing timing requirements. Many companies wish to use the new functions and therefore switch up to the new version. Others, like some suppliers, have to use the new version when their customers migrate to AUTOSAR 4.

#### Reuse through Change

A main feature of the AUTOSAR standard is that developers can reuse tried-and-tested components, which reduces the amount of development work for follow-up projects. Switching up

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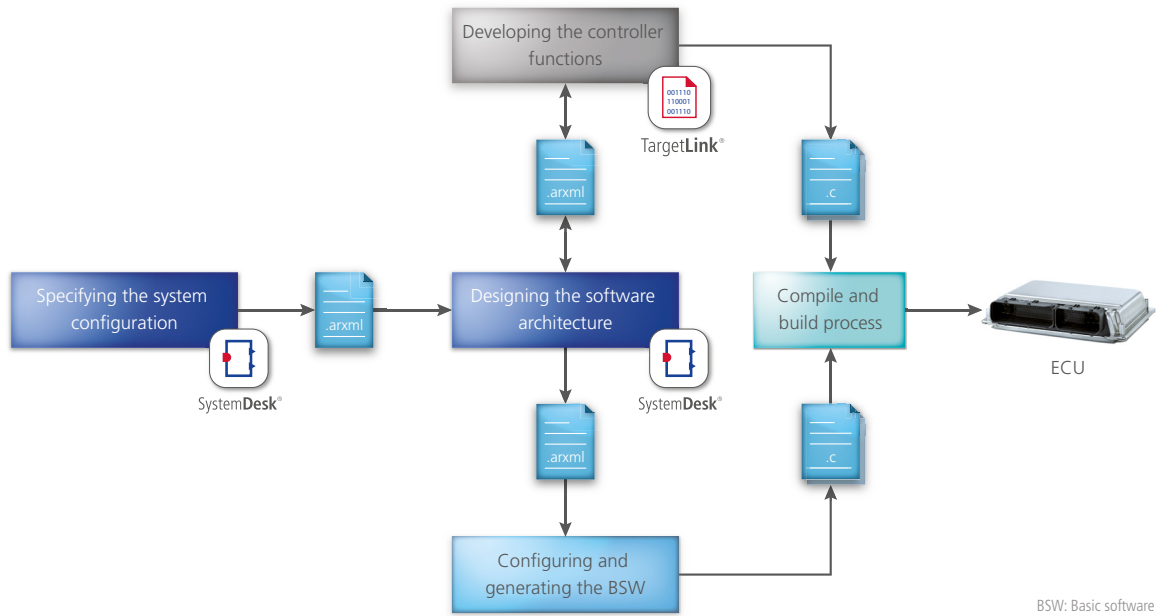


Figure 1: Elements of a potential AUTOSAR tool chain that have to be considered during migration.

from version 3 to 4 pursues the same goal. Ideally, existing models that were modeled according to AUTOSAR 3 should be migrated to AUTOSAR 4 automatically. Then, the new features and functions of AUTOSAR 4 can be used for further development.

A complete migration involves several work steps, and dSPACE provides seamless support if needed.

**Migrating the Component Code**

For migrating individual software components TargetLink®, dSPACE’s

production code generator, is more than just suitable. In TargetLink, when generating production code from the individual functions, the user can define which AUTOSAR version the code will be based on. Because the algorithms for open and

Table 1: dSPACE provides comprehensive support and consultation for the AUTOSAR migration.

Service (Examples)	Details (Extract)
Integrating the AUTOSAR tools into the development process	<ul style="list-style-type: none"> <li>Integration with basic software configuration tools</li> <li>Integration with TargetLink and other behavior modeling tools</li> <li>Adjustments to project-specific solutions for data management (1-D and 3-D motion platforms, steering test benches, piggyback modules for FPGA Base Board)</li> </ul>
Migrating existing architectures	<ul style="list-style-type: none"> <li>Importing existing system and software information from non-AUTOSAR formats</li> <li>Integrating non-AUTOSAR code</li> </ul>
AUTOSAR support	<ul style="list-style-type: none"> <li>Support for introducing the AUTOSAR-compliant development of software architectures</li> </ul>
Model analysis and advice	<ul style="list-style-type: none"> <li>Support for analyzing your models and modeling types with regard to efficiency, safety, and reusability</li> <li>Support for creating and optimizing specific guidelines and in applying industry-proven standards</li> </ul>
Automation	<ul style="list-style-type: none"> <li>Developing project-specific scripts (e.g., mapping architecture elements based on naming conventions, connecting software components based on customer rules)</li> </ul>

closed loop controls are independent of AUTOSAR versions, they only have to be connected to version-specific data. This means that only this connected data has to be adjusted for AUTOSAR 4. TargetLink stores the data in a version-independent Data Dictionary, so AUTOSAR 4-compliant code can be generated just by changing one global property.

### Migrating the Architecture

Due to the large and complex differences between the two AUTOSAR versions, complete system architectures, and larger AUTOSAR system, extracts cannot be migrated at the click of a button. Some processes can be automated via scripts, but these scripts have to be adjusted to each individual case. A converter makes it possible to automatically transform all AUTOSAR 3 elements that are part of the AUTOSAR software component template. This ensures that no information is lost. However, the converter does not create new elements that were added with AUTOSAR 4. dSPACE confers with the customer about what the architecture should look like with AUTOSAR 4. With this information, dSPACE Engineering Services creates customized scripts that generate the desired architecture via the SystemDesk automation interface. Conversion takes place either at dSPACE or at the customer. dSPACE offers various engineering services for the migration (table 1).

### Adjusting the Tool Chain

For a successful migration, developers not only have to keep the AUTOSAR files in mind, but also the entire underlying tool chain. When files are migrated from AUTOSAR 3 to 4, it might be necessary to also update the AUTOSAR tools that are being used, so the new AUTOSAR 4 files can be edited later (figure 1). Here, dSPACE offers a mature tool chain as well as individual advice

and support, letting users benefit from dSPACE's long-standing project experience. In close cooperation with the customer, dSPACE checks which data needs to be migrated, what type of data exists, and whether a single software component or a complete software architecture needs to be migrated. The solution for the migration is then tailored to the individual project needs. dSPACE also offers training on AUTOSAR 4 to make customers familiar with the changes in the new version.

### Validating with SystemDesk

After the migration, dSPACE SystemDesk® can be used for extensive validation. Either the complete system architecture is imported into SystemDesk or individual software components are imported, connected, and integrated to ECU software. SystemDesk Version 4 supports the complete AUTOSAR 4 data model and offers multi-user support. Integrated validation processes let users check the project for consistency and completeness. SystemDesk can also generate virtual ECUs (V-ECUs) from ECU software. The V-ECUs can be simulated on the developer PC without additional hardware, with the simulation platform dSPACE VEOS. ■

## Differences Between AUTOSAR 3 and 4

Some features of AUTOSAR 3 cannot be mapped automatically to AUTOSAR 4 features. Some manual effort is involved in their migration. Some examples for AUTOSAR 4 include the application data types (ADT) for physical information such as units, limits, or scalings, and the implementation data types (IDT) for defining the data type, such as integer. A data type mapping set assigns an implementation data type to each application data type for a software component. AUTOSAR 3 provides only data types (DT) that contain both types of information. There are many different ways to generate ADTs, IDTs, and data type mapping sets for AUTOSAR 4 from the AUTOSAR 3 data types. The mapping can therefore not be automated. It must be defined for each project.