Collaboration Success Story

DENSO INTERNATIONAL EUROPE engages with Silexica to build innovative multicore migration tools for meeting timing, power requirements and an early analysis of any potential migration risks

DENSO is one of the largest global automotive suppliers of advanced technology, systems and components, heading toward an automotive society where cars have less impact on the environment and drivers have fewer worries about traffic accidents. The company is headquartered in the city of Kariya, Aichi, Japan.

DENSO
Crafting the Core

- Revenue: US$ 40.4 billion (FY 2017)
- World's second largest auto parts supplier 2016
- 190 subsidiaries (62 in Japan, 34 in the Americas, 35 in Europe and 59 in Asia/ Oceania)
- Thermal Systems, Powertrain Control Systems, Electronic and Electric Systems, Electric Motors, Industrial Systems, Consumer Products

Client challenges:

Multicore electronic control units (ECUs) have become widely available for the automotive industry. They provide a surplus of computational power in comparison to a single-core processor. However, there is a strong requirement for re-using existing automotive control software for multicore ECUs, as the code is well tested and known to be reliable. This poses a challenge on the migration of legacy software in order to exploit the performance benefits of multicore ECUs. Generally, automotive control software contains many software components, which frequently interact with each other. Runnables, i.e. elementary code pieces, within software components implement the controller's functional behavior. The resulting data dependencies make a manual migration an error-prone, complex, and tedious task. Therefore, developers are seeking support by a toolchain to automate such migration steps.

Scope:

SLX assists the developer during the migration of source code. Manual steps are automated and executed in shorter time with a higher precision. One highlight is the dynamic dependency analysis. All steps are visualized in an intuitive and easy to navigate graphical user interface. Users always have an overview about their complete project, its status, and the parallelization results. DENSO uses the SLX Tool Suite to automate many different migration steps.

Dependency Analysis
Data dependencies between runnables and tasks are analyzed. This analysis of data dependencies constitutes the foundation for the definition of precedence constraints between runnables. Thus, this step is necessary to define the partial order for the execution of runnables.

Runnable-level parallelization
Under this approach, runnables of the same task are distributed to cores and the properties of the original application configuration are kept. That means the original schedule remains unchanged, but the execution time of each task shortens.

AUTOSAR configuration and code generation
A configuration of an AUTOSAR basic software stack is generated for the multicore target processor. Synchronization primitives are added to guarantee precedence constraints between runnables.

Results:

An early prototype of this solution is being used to analyze and optimize powertrain software and assist during the multicore migration.

SLX significantly reduces the workload and is simple to use. The automated workflow allows for many more design options to be explored in a far shorter time.

SILEXICA