



Software erosion protection for embedded software in photovoltaic inverters

SMA Solar Technology AG successfully tackles software erosion with the Axivion Bauhaus Suite. The improved ability to maintain and modify the device software gives SMA an important competitive advantage.

THE CHALLENGE ++ As a market leader in photovoltaic inverters, SMA can supply the right inverter for any module type and performance class anywhere in the world: for small residential systems or large-scale solar farms, for grid-connected installations as well as stand-alone and backup systems.

To efficiently manage the software for its wide variety of products, SMA uses a product line approach. The challenge here lies in retaining the ability to maintain and modify the product line. Due to the long product life cycles of the device software, being able to respond flexibly to changing framework conditions is crucial in order to remain competitive – especially when new standards necessitate changes across the entire product range (e.g. the VDE-AR-N 4105 application guide for generators on the low-voltage network).

THE SOLUTION ++ Integrated software quality assurance has always been a huge priority for SMA. In this respect, not only does SMA focus on external software quality (functionality, reliability, usability and efficiency), but also on internal software quality (maintainability, transferability).

So that it can react flexibly to changing requirements within the context of its product line approach, SMA is careful to ensure that the software architecture and its core assets offer a high degree of modularisation and encapsulation right from the design phase. The automated in-process architecture checking which forms part of the software erosion protection of the Axivion Bauhaus Suite ensures consistent conformity to the architectural concepts used.

In addition, other structures that could jeopardise maintainability (such as cycles and style violations) are also detected during the development phase and can

thus be immediately removed by the respective developer.

The clone management system which is part of Axivion's solution also ensures that all similar parts of the software are adjusted consistently when changes are applied. It is also possible to check the generated code for redundancies automatically in order to save valuable memory on the target system.

"Axivion has enabled us to efficiently monitor our high quality standards. Developers are placed in an environment, in which they can achieve results rapidly and easily."

Peter Schade, Head of Software Development Team Frameworks, SMA Solar Technology AG



“The Axivion Bauhaus Suite was integrated seamlessly into our heterogeneous technical environment with different compilers.”

Robert Dominicus-Schleutermann,
Project Manager responsible for
implementing the Axivion Bauhaus Suite,
SMA Solar Technology AG

THE SUCCESS ++ The objective of protecting the PV inverter product line from software erosion was met in next to no time. The Axivion Bauhaus Suite has significantly improved the ability to maintain and modify the software systems of the inverters.

As a result, the requirements of the current VDE-AR-N 4105 application guide for generators on the low-voltage network could be met with ease.

By consistently checking conformity to the architectural concepts, the planning effort required for changes and adjustments has been reduced. Many of the reviewer’s tasks are now performed automatically by the Axivion Bauhaus Suite, which leaves more time for content checking. This has improved the quality of the reviews overall.

Additional efficiency gains are achieved by using the clone management system, which detects redundant code automatically so that storage space can be saved on the target system. Automating this once manual activity saves several weeks’ development time for every storage-critical change request.

As expected, the improvements in the internal software quality have had a positive effect on the external software quality. Consequently, SMA can continue assuring the same high level of PV inverter quality in the future.

ABOUT SMA ++ The SMA Group with anticipated sales of about EUR 1 billion in 2015 is the global market leader for solar inverters, a key component of all PV plants, and offers innovative key technolo-

gies for future power supply structures. It is headquartered in Niestetal, near Kassel, Germany, and is represented in 20 countries. The Group employs more than 3,500 people worldwide. SMA has an extensive range of products, which offers the right inverters for all module types and plant sizes; for small residential systems as well as large-scale plants, grid-connected photovoltaic systems as well as off-grid and hybrid systems. Moreover, SMA offers system technology for various battery technologies and system sizes and collaborates with renowned battery manufacturers and companies from the automotive industry. The SMA technology is protected by about 700 patents and utility models worldwide.

ABOUT AXIVION ++ Axivion, Stuttgart, Germany is a provider for complete solutions for protection from software erosion. The solutions include the development of innovative software tools – amongst others for static code analysis, architecture verification and clone management – as well as the development of methods, training concepts, and service and consulting for the implementation of measures.

The core product of the company is the Axivion Bauhaus Suite, a tool suite for improvement of software quality and maintainability of software systems implemented in the programming languages Ada, C, C++, C#, and Java. Axivion’s customers are developers of technical software across different industries, e.g. in the field of automotive, railway, electronics, information and telecommunication, medical, avionics, mechanical engineering, and industrial automation. Axivion’s MISRA checker covers 100 % of all automatically testable MISRA rules for the standards MISRA C:2004, MISRA C:2012, and MISRA C++:2008. Since its foundation in 2006, Axivion maintains close research links to the University of Stuttgart, Germany, and to the University of Bremen, Germany to keep up with the newest trends in programming and code analysis research.

More information is available at www.axivion.com

Sources of images: SMA



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stopping software erosion