**axivion**
stopping software erosion

**B** | **BRAUN**
SHARING EXPERTISE

# Software erosion protection
for embedded software in
medical devices

B. Braun uses the Axivion Bauhaus Suite as a quality gate for internally and externally developed components. Assuring the internal quality and maintainability of infusion device software gives B. Braun a crucial competitive advantage.

**THE CHALLENGE ++** Device-based infusion technology at B. Braun has a long, rich history, which has been shaped considerably by its invention of the first syringe pump in 1951. Since then, all subsequent developments have prioritised high standards of quality in conjunction with innovative solutions that simplify daily tasks – resulting in a strong track record spanning more than half a century. Infusion pumps from B. Braun support a wide variety of therapies and can be specifically tailored to the particular conditions of use. This core competence is one of B. Braun's USPs, but at the same time, it presents a daily challenge in terms of developing the hardware and, even more so, the software due to the resultant number of different versions. One of the key strategic requirements is that B. Braun has to have in-house expertise in the core competencies of the therapies concerned.
At very busy times, however, the internal development teams have to be supplemented with external collaborators in order to process large projects quickly and flexibly.
The first challenge here is to guarantee seamless communication with a view to achieving flexible collaboration with multiple partners. The second is to meet the extremely high requirements demanded by medical technology. This calls for strict quality controls, especially with respect to externally developed components.

**THE SOLUTION ++** When developing new infusion pumps, B. Braun relies on a product line with a uniform architecture. This architecture was designed by B. Braun itself and implemented by external partners. To allow flexible collaboration with multiple partners, conformity to the architectures and the specifications for the internal software quality is absolutely essential.
For this reason, the Axivion Bauhaus Suite is used during the development phase to check conformity to the architectural specifications, as well as other guidelines covering the internal quality and maintainability of the infusion device software. As part of the acceptance procedure for externally developed components, the Axivion Bauhaus Suite also functions as a quality gate, ensuring that internal and external development both meet the

*"When it comes to implementing our quality standards, the Axivion Bauhaus Suite is a major help from the perspective of integrating external suppliers."*

Stephan Drozniak, Software Development Manager for Infusion Systems, B. Braun Melsungen AG

same architectural specifications and quality guidelines.

Due to the generic and open nature of the Axivion Bauhaus Suite, the automated analyses of the software erosion protection could be tailored perfectly to the technologies used by B. Braun.

**THE SUCCESS ++** By analysing and checking internally and externally developed software in this way, the subsystems of different development strands can be perfectly dovetailed. Deviations from the uniform product line architecture and the specified quality benchmarks are detected immediately so that appropriate measures can be taken promptly.

New development partners of B. Braun quickly find their way around the architecture, enabling them to become productive in next to no time. Plans can be executed based on the architecture without the need for extensive training. Hidden dependencies and the resulting side effects are eliminated for good.

The product line architecture is actually implemented in practice and does not just exist on paper. The multitude of different versions is now easier to manage, freeing up more resources for development and for improving the actual therapies.

B. Braun is thoroughly fit for the future in the highly competitive environment of infusion device manufacturers. By using the Axivion Bauhaus Suite to check the maintainability and internal quality of its software, B. Braun will be able to retain this competitive advantage over the long term.

**ABOUT B. BRAUN ++** B. Braun supplies the global healthcare market with products for anaesthesia, intensive medicine, cardiology, extracorporeal blood treatment and surgery, as well as services for hospitals, general practitioners and the homecare sector.

Through dialogue with those who are using B. Braun's products on a daily basis, the company is continually gaining new knowledge which it incorporates into its product development. In this way, the company creates innovative products and services that help to optimise working procedures in hospitals and medical practices all over the world and help to improve safety – for patients, doctors and nursing staff.

With some 44,000 employees in over 50 countries, B. Braun achieved a turnover of 4.6 billion euros in 2011.

**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: B. Braun