axivion
stopping software erosion

Dentsply Sirona

THE DENTAL
SOLUTIONS
COMPANY™

Rule-compliant code and uniform architecture for dentistry technology

Every day around 600,000 dentists and dental technicians use products from Dentsply Sirona. The enterprise is the world's largest and most diversified manufacturer of dental products. In the fields of CAD/CAM, Imaging Systems and Treatment Units, Dentsply Sirona's software developers use the Axivion Bauhaus Suite for code and architecture verification in order to ensure that they design software which is rule-compliant, state-of-the-art and maintainable in the long term.

THE CHALLENGE ++ As the market leader in dental appliances, Dentsply Sirona has the industry's largest R&D department where it develops innovative end-to-end clinical solutions designed to improve patient care. Large numbers of in-house and external developers work at various locations, both in teams and entirely independently, on the software for CAD/CAM solutions for dental laboratories and dentists' practices, imaging systems such as 2D and 3D x-ray machines and treatment units featuring a comprehensively equipped patient's chair plus dentist's interface. Driven by the ever-increasing complexity of the systems involved, the need has arisen, particularly in these product areas, to maintain the inherent quality of the products using predefined coding rules and uniform software architecture. Another criterion for the software

development process was to cater for the human factor. For instance, in the event of unforeseen personnel shortages, the projects needed to be easier to carry forward and it had to be possible to integrate new team members more rapidly and seamlessly into the development processes. To boost the efficiency of time-consuming manual code reviews by key individual personnel, a further requirement was the establishment of a joint, tool-based process for code and architecture verification and dealing with the ensuing results. The requirements for the tool by different departments were diverse. For instance, it had to be usable together with different development environments and compilers. Due to the sheer size of some of the projects, the tool also needed to be scalable for the analysis of large volumes of code and also, when using IBM Rational

Rhapsody® and automated code generation, capable of distinguishing between machine- and manually-generated code. In the process, it had to be able to deal with the existing code base appropriately in order to safeguard its integrity so that newly-written code could be developed which did not deviate from that base.

"The Axivion Bauhaus Suite provides us with vital support in ensuring our software quality. Its checks are not merely driven by existing standards, they even exceed the required level."

Michael Dalpiaz, Head of Embedded Software, Dentsply Sirona

A further requirement was for the tool to generate automated reports whereby developers could record their working progress and the quality of their work.

THE SOLUTION ++ After assessing various options, Dentsply Sirona's decision makers opted for the Axivion Bauhaus Suite. The tool suite's functions meet every central requirement for automated architecture and code analysis. Another factor that won Dentsply Sirona over was the suite's handling of clones: The Axivion Bauhaus Suite's user-friendly clone management allows it to distinguish between potentially problematic code duplications and deliberately implemented clones, thus treating them differently in the reports. Furthermore, during the other checks, Axivion's delta analysis allows it to screen out the checking of legacy code and focus exclusively on analysing new parts of the program. On top of this, the tool suite distinguishes reliably between handwritten code and parts of the software generated automatically, for instance using IBM Rational Rhapsody®. For the performance of these tasks, the Axivion Bauhaus Suite is completely scalable both in terms of the introduction of checks, which can be rolled out step by step in order to keep developers' motivation high, and in terms of project sizes. Thus, it can analyse anything from embedded projects to major C++ and C# projects. A final key factor for Dentsply Sirona was the ease with which the tool could be integrated into their existing development process. Without any great effort on the individual developers' parts, the Axivion Bauhaus Suite could be incorporated into the company-specific process and deployed rapidly to productive effect, with maximum acceptance by all those involved.

THE SUCCESS ++ This high degree of acceptance resulted from the tangible success of the structured, automated code and architecture verification process at Dentsply Sirona, which became apparent soon after the introduction of the Axivion Bauhaus Suite. Alongside the outstanding clone management, personnel greatly appreciate the added value offered by the architectural verification, while developers are particularly keen on the interfaces with IBM Rational Rhapsody® and Enterprise Architect®. Thanks to the seamless integration of the tool, the UML models can not only be used for code generation, they can also be specified as the target architecture for the entire product. Furthermore, on projects where Axivion's architecture modeller is being used, developers also now rapidly receive information on any deviations from the architecture's actual implementation which means that architects and developers can take prompt countermeasures. This not only directly safeguards and enhances the code quality but also augments the developers' long-term know-how. Moreover, the Axivion Bauhaus Suite provides project leaders with a tool which enables them to ensure that the architectures are reliably implemented by external programmers and suppliers. The process of training new personnel is made considerably easier. The continuous checking of the joint coding rules supports the developers and is also of direct benefit for their own work. Software architects and developers who refine the existing code feel particularly motivated by the fact that targeted analysis requiring a manageable amount of work enables them to detect potential weaknesses in new code at an early stage, something which had previously been highly labour-intensive when dealing with legacy software. The Axivion Bauhaus Suite has therefore greatly enhanced the efficiency of Dentsply Sirona's software development processes. Its use directly supports every single employee in their quality-aware development work, thus providing a strong base for making productive progress on the projects as a whole. The outcome is high-quality software of proven compliance with standards which lays the foundation for products built on future-proof code which can be readily maintained and updated.

ABOUT DENTSPLY SIRONA ++ Dentsply Sirona is the world's largest manufacturer of dental products and technologies. The company supports dentists and dental technicians in providing better, faster and safer dental care. As The Dental Solutions Company™, Dentsply Sirona offers dentists a comprehensive range of end-to-end solutions. The company's range includes many of the best-known and most well established brands on the market.
Dentsply Sirona employs some 15,000 dedicated personnel in over 40 countries all round the world.

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. Furthermore, the CERT® programming rules for secure software development are supported.
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.

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