

Siemens Healthcare and Cadence

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Torsten König, Lead Verification Architect, Siemens Healthcare

The Customer

Siemens AG is a global powerhouse in electronics and electrical engineering, supplying innovative products and eco-friendly solutions to sectors such as energy, healthcare, industry, and infrastructure/cities.

Medical Electronics and Imaging Solutions, a Siemens Healthcare business segment, provides imaging systems for diagnosis, therapy equipment for treatment, and other electronic systems for the medical industry. With expertise spanning development to production under one roof, the Medical Electronics and Imaging Solutions group can either manage entire product lifecycles or support select phases depending on customer needs.

The Challenge

When Siemens Healthcare embarked upon a new image-chain design, they had several key requirements. The platform needed to be extremely reliable and flexible, which required a modern verification environment.

Image-chain designs are central to medical imaging, a technique used to create images of the human body for clinical purposes. The designs enable high-quality medical images to be transferred at high speed and low latency. Because the new Siemens Healthcare image-chain design would be used to save lives, the reliability of the technology was paramount.

“Emergency room physicians use medical-imaging devices to locate injuries and other health problems in their patients,” explains Torsten König, Lead Verification Architect at Siemens Healthcare. “The applications in these devices must be extremely reliable and not lose any pictures taken during the procedure.”

Business Challenge

- New image-chain platform design demanded the highest levels of quality, reliability, and flexibility, which would require a more effective verification environment

Design Challenges

- Existing verification flow hampered productivity
- Incomplete language implementation and immature tools
- Repeated recodes
- Lack of automation and reuse

Cadence Solutions

- Incisive Enterprise Specman Elite Testbench
- Incisive Enterprise Manager
- Customer Support

Results

- Increased verification productivity by 30% compared to previous methodology
- Delivered reliable platform on time, with no unexpected delays
- Achieved flexibility for future expansion

In addition to offering high levels of quality and reliability, the new image-chain design needed to be flexible to accommodate future expansion. The design consisted of multiple boards with various on-chip and inter-chip protocols and field-programmable gate arrays (FPGAs).

König knew verification would play an essential role in this design project. The team had a verification flow in place, but it was not optimal for the task. Progress was slow, tool stability was an issue, and the verification environment lacked flexibility.

“Our team’s job is to ensure, to the best of our ability, that the system is always reliable, that it always works as intended, and that the results are always what we expect them to be,” König says. “We can’t compromise; we have to be sure. And we needed a new verification process to be sure.”

The Solution

König had previously worked in another Siemens sector, where he had used Specman technology for verification and was pleased with the outcome. He suggested to his new team that they try Cadence® Incisive® Enterprise Specman Elite® Testbench on the image-chain design to achieve the required levels of quality, reliability, and flexibility.

“The nature of verification is that as the verification environment matures, you normally get bugs you didn’t think of before,” König says. “If you don’t find bugs at this stage, it’s an alarming sign. You either have a genius, fail-proof designer or you don’t have a great verification process. When we started working with Specman technology and found all the constrained-random verification bugs that we expected to find, this was comforting.”

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Enterprise Specman Elite Testbench uses executable specifications and designer-specified constraints to automate testbench generation, while simultaneously detecting misrepresentations of the specs. Its automated data- and assertion-checking speeds debug, while its functional coverage analysis capability drives verification. Specman technology also supports industry-standard verification languages and methodologies, so engineers can quickly and easily integrate it with established verification flows.

According to König, the transition to *e* was painless and fast—taking only a couple days—and immediately improved the team’s overall quality and productivity. “In every verification module, we have a typical curve of bugs that starts slow and then explodes before the curve steadies again,” König explains. “Metric-driven design helps us to assess how far along modules are in the development stage.”

Introducing *e* also brought new and much-needed flexibility to the table. The Siemens verification team could easily implement the required functionality into the design while keeping their options open for future enhancements.

“With the *e* Reuse Methodology (eRM), we can verify a module of another FPGA that’s used in the system by merely adding another interface subtype,” König explains. “We were able to prove that we can adapt to moving targets, which is very important because system and module requirements often evolve during the design and verification process.”

Using Specman technology, engineers can easily adapt their verification environment and quickly port designs to new projects. This has reduced the Siemens team’s overhead by 30% compared to when they used the previous verification methodology.

“Constrained-random verification enabled us to create libraries, allowing us to reuse the same test run and still reach our coverage goals,” König says. “Regression management and multiple reruns ensure that we catch everything.”

Incisive Enterprise Manager enables numerous reruns so the design team can concentrate on other tasks and increase productivity. Because the tool is completely automated, the verification team doesn’t have to think about new stimuli. Incisive Enterprise Manager also improves project predictability by providing a higher-quality verification plan, detailed progress monitoring, and metrics-based measurement of verification completion.

Yet another benefit of working with Cadence, according to König, is a knowledgeable and responsive customer support team. Early in the engagement, the Siemens design team opened a service request to address a simulator issue. Cadence Customer Support pinpointed the problem and fixed it within 48 hours.

Summary and Future Plans

“The Incisive toolflow has enabled us to effectively and efficiently capture and analyze all of our coverage,” König says. “We can verify that required optimizations in hardware description language (HDL) aren’t introducing new bugs into the design, and that no buggy component is handed over to the test team to waste their time. So far no functional bug has slipped through our net.”

Using Cadence solutions has been so successful for this image-chain design project that Siemens plans to use the new constrained-random verification flow in all future projects.

“We’re telling all of our customers about what a good investment this is,” König says. “Some may think of project verification as an additional cost. But without verification, you end up putting more money into testing because critical bugs slip through. We can prevent this with a solid verification flow for every project.”



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