



CADENCE AND 3LEAF NETWORKS

3Leaf Networks Improves Quality, Shortens Cycle by Adding Cadence Incisive Formal Verifier to their System Verification Process

“We needed to enhance and shorten our overall design cycle quickly, and using the Incisive Formal Verifier allowed us to do that easily. Even as new users, we have already been able to increase our verification efficiency dramatically, particularly with complex control blocks where accuracy is critical to achieving first silicon success.”

Bob Quinn, CEO, 3Leaf Networks

CORPORATE PROFILE

- 3Leaf Networks develops the infrastructure to support both scaleup and scale-out virtual servers for enterprise data centers

DESIGN CHALLENGE

- Shorten the overall design and verification process time
- Incorporate a formal verification strategy into the existing flow to increase the quality of results over simulation

CADENCE SOLUTION

- Introduced the design team to a formal verification strategy as part of the Assertion-based Verification flow that allowed them to accelerate ramp up and achieve desired results for both quality and efficiency

CADENCE PRODUCTS AND SERVICES

- Cadence Incisive® Formal Verifier

MEMORY IS THE NETWORK

Founded in 2004 and headquartered in Santa Clara, California, 3Leaf Networks has created an infrastructure that can support both the scale-up and scale-out of virtual servers. Their unique approach is transparent to existing enterprise applications, and enables customers to achieve higher levels of utilization, increased availability, reduced cost, and improved scalability.

3Leaf Networks has a small design team that is responsible for both design and verification. Their verification process uses a test generator that automatically explores the design space under the guidance of the designers, who then increase coverage by running on hundreds of simulators. However, a number of small complex control blocks represent a significant percentage of the design space. A design of this nature is well suited to using formal verification to verify these control blocks, resulting in a

substantial decrease in the design space for verification by their simulation-based tools. “In addition to shortening our design cycle, we needed to increase our verification coverage,” said Bob Quinn, CEO, 3Leaf Networks. “Automated state space exploration with simulation remained our plan of record, as we were uncertain about the time it would take for our team to come up to speed on a new verification technique, and we were unsure about the capability of the new tools to process our control blocks.”

PRODUCTIVITY GAINS, QUALITY RESULTS TOP LIST FOR FORMAL VERIFIER

The 3Leaf Networks design team approached Cadence to determine the best course of action. “We were already using the Cadence Incisive functional verification platform for HDL simulation as well as SystemC®,” continued Quinn. “We discussed our time-to-market and quality goals with Cadence, as well as

"I was pleasantly surprised at how quickly the team was able to come up to speed on the Incisive Formal Verifier, and to see the designers actively using this technology and methodology to start verifying the design on their own within a few days."

Bob Quinn, CEO, 3Leaf Networks

"We found that we now had access to advanced debug features that seamlessly extended the capabilities of our existing simulation solution," continued Quinn. "Working in such a familiar environment eases the process of adopting new techniques and takes us beyond the capabilities of simulation alone."

A feature of Incisive Formal Verifier that was particularly useful to the 3Leaf Networks team was the ability to support "liveness" properties. "What this allowed us to do was to let the Incisive Formal Verifier know that an event should eventually occur, and it would automatically perform the exhaustive tests that needed to be done to make sure we didn't miss an event," said Quinn. "This is a powerful feature that replaces a very large number of cycles in a simulation environment."

3LEAF NETWORKS LOOKS FORWARD TO CONTINUED VERIFICATION PROCESS IMPROVEMENTS

The 3Leaf Networks design team found that formal verification was a very powerful addition to their overall verification process. By working closely with Cadence, they were able to adopt the new methodology without missing a beat, and actually improved their results and schedule on the first design. "The most exciting thing for us is knowing that as we develop more expertise on this methodology, we will continue to see improved results in both productivity and quality," said Quinn. "We get more for less."

our concerns regarding ramp-up time on a new methodology. They suggested implementing the Incisive Formal Verifier as part of the Assertion-based Verification (ABV) flow since it is already tightly integrated with our existing verification environment."

3LEAF NETWORKS TEAM RAMPs UP QUICKLY ON NEW FORMAL VERIFICATION METHODOLOGY

The 3Leaf Networks design team decided to introduce the Incisive Formal Verifier on a design to be used in several of their customer applications. Cadence brought in a small support team to work on site with the 3Leaf Networks engineers to address any learning issues real-time. The effective hands-on knowledge transfer of the Design Level Formal Analysis methodology as part of the overall assertionbased verification (ABV) methodology, as well as discussion of best practices, helped maximize the benefits of formal verification from the start. "We were asking a lot of our design team on this project," said Quinn. "In addition to learning a new methodology, they were learning how to effectively write assertions for use by both formal and simulation tools. I was pleasantly surprised

at how quickly the team was able to come up to speed on the Incisive Formal Verifier, and to see the designers actively using this technology and methodology to start verifying the design on their own within a few days."

NEW VERIFICATION TECHNIQUES IMPROVE QUALITY

Adopting a formal verification methodology allowed the 3Leaf Networks team to address quality issues very early in the design process. Since Incisive Formal Verifier does not require a testbench, the team was able to begin their verification process when they were designing their blocks, well before testbench development or simulation. "We needed to enhance and shorten our overall design cycle quickly, and using the Incisive Formal Verifier allowed us to do that easily," said Quinn. "Even as new users, we have already been able to increase our verification efficiency dramatically, particularly with complex control blocks where accuracy is critical to achieving first silicon success."

The combination of the Incisive Formal Verifier and Incisive Unified Simulator in an ABV flow creates a comprehensive, easy-to-use debug environment, which the 3Leaf Networks team found helpful.

cadence™

Cadence Design Systems, Inc.

CORPORATE HEADQUARTERS

2655 Seely Avenue
San Jose, CA 95134
P: +1.800.746.6223 (within US)
+1.408.943.1234 (outside US)
F: +1.408.943.5001
www.cadence.com

For more information about this and other products contact:

info@cadence.com

or log on to:

www.cadence.com