

Novas Software: Design Better, Debug Faster



LSI Logic Relies on Debussy to Manage Unfamiliar Design Challenges

Background

LSI Logic Corporation (NYSE: LSI) is a leading designer and manufacturer of communications, consumer and storage semiconductors for applications that access, interconnect and store data, voice and video. In addition, the company supplies storage network solutions for the enterprise. As the foremost global supplier of custom, high-performance semiconductors, LSI partners with trend-setting electronics companies to build complete systems on a single chip. Customers take advantage of LSI Logic's unique CoreWare[®] methodology to increase performance, lower system costs and accelerate bringing their products to market.

LSI serves companies that require advanced ASICs or proven customized solutions. It maintains a worldwide design services organization and its own leading edge, ISO 9000-certified manufacturing facilities.

ASIC Design Services: A mandate for efficiency

Steve Leung is an area manager in LSI Logic's Design Services organization, overseeing the company's Silicon Valley design center. His team is responsible for supporting all ASIC engagements within the company's major customer base. In that role, the team works on a wide variety of ASIC products for a broad spectrum of applications. They are charged with ensuring that custom requirements of LSI Logic's customers can be successfully implemented in leading-edge silicon processes. The nature of this type of business model means that engineers are often tasked with working on designs that were originally developed by someone else.

Although Leung's team uses a sophisticated set of internally-developed and commercial EDA tools for simulation, synthesis, test insertion and place-and-route, the challenge of working with 'foreign' design elements is daunting. A significant responsibility for the ASIC Customer Engineers (ACEs) in the design services organization is to correct mismatches in logic implementation or timing-related issues in the designs they receive from their customers. A thorough understanding of the behavior of all the design elements is required in order to truly comprehend the downstream consequences of specific actions, errors or bug fixes. This is extremely difficult, if not



impossible, when the individual attempting to integrate a block or debug a failure is unfamiliar with the logic.

"We have to be as efficient as possible in order to meet our customers' demanding time-to-market schedules. We can't be the bottleneck in the way of getting their products developed," said Leung. "But because of the nature of the ASIC business model, we are required to deal with designs in which we were not originally involved."

Navigating unfamiliar designs

Because the team often works on designs with which they are unfamiliar, they are presented with some unique challenges when it comes to debugging. For a complex design, the process involves the tracing of connections between elements, and then locating and isolating the relevant logic pieces in order to build a mental picture of causes and effects. Previously, Steve's team had relied on waveform viewing tools that came with the simulators they used. But as designs have increased in complexity — and in the amount of unfamiliar code they contain — the team knew they needed a better approach.



Novas Software has been offering its Debussy® Knowledge-Based Debug System for several years to engineers with the same types of challenges as LSI Logic's team faced. Debussy's popularity stems from its ability to help designers better understand design behavior through an efficient, integrated set of visualization and analysis tools, even if the design is completely new to them. By doing that, the Novas system brings a new level of productivity and efficiency to engineers, often cutting the time they spend in debug by half or more.

A member of Leung's team recalls the difficulty of debugging unfamiliar designs before the team used Debussy: "I had just one day to get my JTAG insertion and simulation working on an important test chip. The only thing I could figure out from the simulation logs was that only my LVDS IOs had mismatches, but I knew not all the LVDS IOs had a problem. I couldn't figure out exactly where the X's were coming from using the schematic tracer in the tools we had."

The same engineer recalls a vastly improved experience when first introduced to Debussy: "It took me about 5-10 minutes to set up the tool. With a little help on how to navigate through the tool, I was able to simultaneously view the waveform and the schematic, and the cool thing was with a click of a button on the waveform viewer, the schematic being viewed was updated with the values on their nets/pins at that particular time in the simulation. Within minutes, the problem was tracked to an incomplete instantiation of some of the IOs and a Verilog model definition problem. It was a two hour effort and the problem was solved, compared to working a whole day and still not finding the source of the error."

This type of productivity is critical to LSI Logic's team as it works on new designs. Debussy is the ideal complement to its leading-edge design approach, which is often used in a design services capacity to debug its customers' designs. "The only way to fully appreciate Debussy is to spend time debugging a simulation using another tool, then switch to Debussy. It's not just a waveform viewer, it is a debugging solution," says one LSI engineer.

The engineers especially like the completeness of the Debussy system and how various modules for waveform viewing, schematic browsing and text editing are all integrated. Debussy uses active annotation, which means users can have simulation information not only in the waveform, but also in the design browser and the schematic browser. "You are able to see what the value of a gate or pin is instantly, instead of having to switch back and forth between multiple tools," another engineer pointed out, noting the efficiency when working a design that originated somewhere else.

This type of integration also eliminates the need to convert design elements to special libraries required by waveform tools. Another LSI engineer points out that benefit: "If you had a design that had part RTL or all RTL, you have a means to view it in its entirety during debug. I found this highly useful when, for example, I have a memory model that I force faults in. I want to see the behavior of its simulation results. Debussy allows you to see a fan-in or fan-out cone, and you don't have to write a specialized script to do it."

"In short, Debussy is a complete debug system — waveforms, source code, and schematic views, all tightly integrated and all actively linked with each other. It's the ability to interact with these views — to quickly move from question to answer at the click of a mouse — that makes it such an awesome tool!"

For Leung and his team, the bottom line is about saving time and working smarter, especially when navigating unfamiliar design elements that their customers handed off to them. While figuring out how the design works or why it has failed is not work that moves designs forward or adds value to end products, many projects miss their deadlines when integration mistakes happen because engineers didn't understand design requirements or because it took way longer than expected to track down the root cause of a bug. One team member offered up a quick analysis based on his experience of achieving a 10x improvement in efficiency by using Debussy. "Say our design center does 15 ASICs a year. If we can get our debug time down from three days, which had been typical, to a few hours with Debussy, we can save a lot of money. Plus the time we would have lost can be used doing more productive things, such as working more closely with the customers."

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