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Accelerating Innovation

Synopsys and Signalcrafters Tech, Inc.

Signalcrafters Achieves Design Goals and Cuts FPGA Cost by 50%
in its FPGA-for-DSP Solution with Synplify FPGA Design Tools

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The Synopsys Synplify solution is the heart of our FPGA-for-DSP design flow. The biggest reason, of course, is that it's the only one that works for our needs, and we've tried them all. It provides everything you want in a design environment: speed, quality of results, ease of use, and it's backed up Synopsys support."

Alan Jayson
Product Engineer, Signalcrafters Tech, Inc.

Summary

In Signalcrafters' first attempt to use an FPGA for DSP algorithms, their development environment kept producing erroneous results. After evaluating the other solutions available on the market, Signalcrafters found that only one — Synplify Pro® software from Synopsys — generated output that worked. As an unexpected bonus, the Synopsys solution reduced the FPGA's area by 25%, which allowed Signalcrafters to save 50% on FPGA costs. Signalcrafters also acquired the Synphony MC solution for incorporation into the flow. With many built-in features that speed FPGA-for-DSP designs, Signalcrafters expects the Synphony MC tool will save substantially on development time as the company capitalizes on the cost savings opportunities this technology makes possible.

Synplify Pro Software, the Key Enabler for Signalcrafters' FPGA-for-DSP Thrust

Signalcrafters produces instrumentation and communication equipment for several industries, but the company focuses most of its effort on the market it was originally founded to serve — test equipment for power utilities. Power companies buy Signalcrafters products today for the same reason they did in 1979, because they cut power line carrier system calibration time by an order of magnitude.

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Alan Jayson
Product Engineer, Signalcrafters Tech, Inc.

In early 2005, Signalcrafters launched the design of its latest test and calibration product, the Model 120, which was especially important to the business because, for the first time, it incorporates an FPGA to perform the design's many DSP functions. In the past, Signalcrafters, like other designers of DSP-intensive products, used individual chips for every DSP function and paid the price in terms of performance, area, and cost. Now that the FPGA industry is producing devices that can execute many DSP functions simultaneously, such as the Altera Stratix II in this case, Signalcrafters seized the opportunity to create a design that simply could not have met performance requirements with DSP processors. The specification called for generating nine sine/cosine and noise waveforms simultaneously, four of which had variable frequencies — a task that took four devices in the past.

By packing the functionality of four devices into one, Signalcrafters stood to benefit greatly on the bottom line. However, using the software environment originally in place, engineering could not get the design to work. The foremost problem was that filters did not operate properly after they flowed through the DSP and vendor FPGA synthesis software.

"We tried everything we could think of," said Alan Jayson, Product Engineer. "After tearing our hair out for over a month, we decided we'd better find another solution. I'd heard good things about Synopsys from friends in the industry, so we decided to give the Synplify Pro solution a try. It worked perfectly, right out of the box. It's so intuitive I didn't even need to read the documentation."

"Synplify Pro software solved all the problems we'd been having and allowed us to meet every design goal," Jayson continued. "It even reduced the FPGA's area by 25 percent — an unexpected bonus that's cutting our FPGA costs in half. The Synplify Pro solution did a great job of optimizing the use of chip resources, and it showed us how far off the mark our existing software was."

Synplify DSP Software Introduces Even More Benefits

Signalcrafters is also using another Synopsys product, Synplify DSP, and the two companies are now readying it for incorporation into the standard flow. Once the Synplify DSP product is installed, Synopsys solutions will completely replace the other vendor's DSP and FPGA synthesis products. Designs will flow from Simulink® to the Synplify DSP solution, where Signalcrafters will create block diagrams and perform DSP synthesis. RTL created by Synplify DSP software will then flow to the Synplify Pro environment for FPGA synthesis and on to Altera place-and-route software.

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"We're really excited about all the features the Synplify DSP tool has that will save us development time," said Jayson. "We'll be able to take a filter from Simulink and immediately incorporate it into a design, skipping all the extra export/import steps that the other software required. Synplify DSP software has a number of built-in features that we use all the time such as log, sine, and noise generators. In addition, it generates our choice of Verilog or VHDL, whereas the other system is strictly VHDL. For most companies it has another advantage too, vendor independence, although that one doesn't matter to us since we're strictly affiliated with Altera."

Synopsys — The Only FPGA-for-DSP Toolset that Meets Signalcrafters' Needs

Now that the Model 120 chip has taped out successfully, Signalcrafters is preparing for the next round of FPGA-for-DSP deployments. "Since they pack so much onto one chip, these products are the key to entering other markets we've been targeting, and so they're going to be an enormous part of our future," said Jayson. "Our Synplify solution is the heart of our FPGA-for-DSP design flow. The biggest reason of course, is that it's the only one that works for our needs, and we've tried them all. But there are other reasons, too: it provides everything you want in a design environment — speed, quality of results, ease of use — and it's backed up by Synopsys support that we're really pleased with."

"We're a small company that doesn't make investments of this nature at all lightly," Jayson concluded, "but our Synplify toolset is one investment that's been well worth it already, and it's only going to be more valuable in the future."