

# Synopsys and Corrent Corporation

“Synopsys Professional Services was very responsive to the startup environment. They were a major contributor to our success.”

**Satish Anand, Chief Technical Officer and Co-founder, Corrent Corporation**

## **Business**

Corrent Corporation is a privately held fabless semiconductor company focusing on the development of high-performance, standards-based network security silicon chips for the high-speed Internet. Using industry-standard security protocols, Internet Protocol Security (IPSec) and Secure Socket Layer (SSL), Corrent is developing high performance Internet-based security solutions for use in the next-generation OEM virtual private networks (VPNs) and e-commerce equipment. Corrent's vision is to deliver “Internet Security at Light Speed.”

## **Issues**

- Focus on the core design rather than on establishing methodologies and flows
- Accelerate the design schedule by bringing in expert resources to take a representative block through the process
- Address specific timing and congestion issues

## **Solution**

- Synopsys Professional Services provided design optimization and integration expertise for Corrent's first chips, the CR7020 and CR7000
- Established new methodology using Physical Compiler™, Power Compiler™, DFT Compiler, DCUltra™, PrimeTime® and VCS™ to facilitate current and future development projects

## **Benefits**

- Reduced time to market
- Repeatable, flexible processes for future chips
- “Startup mentality” consultants who exceeded expectations
- Reduced risk with adopting a new methodology for the first chip design
- Access to the latest Synopsys R&D
- Meet timing and performance requirements for 150 MHZ domain with 2.2 million placeable instances

**Without burdening the network processor, Corrent's gigabit-speed internet security chip performs VPN or IPsec packet processing at line speeds.**



### **Corrent Eliminates the Security Bottleneck for High-Speed Networks**

New, extremely high-performance security processors from Corrent enable security for fast, next-generation optical networks. The CR7020 and CR7000, Corrent's first products from its family of Socket Armor™ Security Processors, provide gigabit-speed streaming encryption and public key acceleration in single chip implementations. To help take Socket Armor to silicon, Corrent asked Synopsys Professional Services for assistance with Synopsys tools and methodologies. Synopsys consultants established flexible, repeatable flows, integrated Synopsys tools with design planning and layout/routing tools, found ways to overcome congestion issues, and performed complex timing analyses to help Corrent achieve a successful tape-out.

Security slows things down—it's a fact of life. High-speed networks are no different. As soon as security features are turned on, throughput drops dramatically. Consequently, people who demand the fastest possible network connections must trade off speed for security. Corrent Corporation wants to change that.

The company's Socket Armor family of processors support both SSL and IPsec standards and are aimed squarely at making the Internet 100-percent secure. "It's not really a pie-in-the-sky concept," says Hemanshu Bhatnagar, vice president of engineering and a Corrent co-founder, "we see signs of significant progress over the next 3-5 years."

As more and more valuable intellectual property starts being exchanged across high-speed networks, security will be essential. Corrent itself is a case in point. Like many startup companies, Corrent assembles the talent they need from all over the world. Their team constantly exchanges design concepts over the Internet. These are Corrent's "crown jewels"—intellectual property of the highest value. Corrent keeps this data secure with the same end-to-end solution it offers to its customers: security expertise, high-performance security processors, plug-in boards, and software.

What makes Corrent special is the extreme functionality and flexibility of their solutions. For example, Corrent security can be incorporated into new network servers and switches, or added to existing infrastructure as an add-in card. Further, says Neel Das, director of ASIC Integration, "Our design is modular. We can scale it very efficiently, and we can change pieces of the design without having changes ripple through the rest of the design." "What that means," says Satish Anand, chief technical officer and Corrent co-founder, "is that we can rapidly adapt our design to solve the problems our customers (primarily service providers and equipment vendors) encounter in the field."

Bringing in Synopsys Professional Services allowed Corrent to focus its core expertise on creating this flexible and modular design architecture. The Corrent team wanted to execute quickly and not get hung up on implementation and methodology issues. Synopsys Professional Services helped them go from the planning phase to delivery of two fully functional chips in just seven months.

“We have the methodology in place, which is very repeatable, and our processes are well under control. Synopsys provided a lot of value quickly.”

**Hemanshu Bhatnagar, Vice President of Engineering and Co-founder, Corrent Corporation**

#### **Time to Get Cranking on the Design**

Corrent needed to prove their ideas in silicon rapidly to maximize venture capital funding opportunities. While their vision and approach was very clear and strong, their design was not as mature at the outset as they would have liked. They needed to spend more effort on the verification and implementation aspects, and at the same time develop a complete design flow using Physical Compiler and other Synopsys tools—Power Compiler, DFT Compiler, DCUltra, PrimeTime, and VCS. They also needed to validate the preliminary chip-level performance results, optimize their block designs, and ensure the new tool flow interfaced seamlessly with design planning tools and post-optimization, and with layout and routing tools. Ambitious goals given their time-to-market pressures.

#### **Predictable Results in a Predictable Time**

Synopsys Professional Services responded by doing more than just “driving the tool.” Design consultants helped Corrent establish the entire flow by prototyping a representative block design, resolving the design constraints, and maximizing the performance using Physical Compiler with other tools Corrent was using. Repeatability was excellent. Once Corrent had a block of design staged, it was easy to turn it around, even if the design changed, and get predictable results in a predictable time.

“Synopsys played a major role in providing scripts and coming up with optimization methodology for the team, training the team, and helping us develop a good understanding of a new tool,” says Anand.

Key to Synopsys' success in this area was the consultants' ability, and willingness, to make the flow work using third-party tools.

#### **Access to the Latest R&D**

Synopsys Professional Services provided onsite expertise to facilitate knowledge transfer to the Corrent team. In addition, because Corrent was a design “power user” with somewhat unusual requirements, Synopsys provided Corrent with an early-release version of Physical Compiler that incorporated algorithms for localized congestion optimization. For Synopsys, it was a real-life opportunity to refine those algorithms and deliver robust congestion solutions.

“That was a win-win combination,” says Bhatnagar. “We helped Synopsys by giving them a test case, and in return we got our solutions quickly.”

#### **Support at Crunch Time**

Corrent needed a design partner who fully appreciated the startup environment, who would invest in building a relationship and who would be there at crunch time. “Being a startup,” says Anand, “we expected Synopsys to go the extra mile for us during crunch times and to get a tape-out.”

Synopsys met all these expectations with flying colors. “Synopsys Professional Services was very diligent in helping us out, above and beyond the contract,” says Bhatnagar. “The fact that they took ownership helped us drive to a solution much quicker.”

### **Flawless Execution, Clear Vision**

Like any startup company on the cutting edge of technology, Corrent must execute flawlessly, on time and on schedule. So far they have been successful, in part because of help from Synopsys. But they also have a very clear vision of how to implement high-speed security for high-speed networks. In a world where high speed interface standards are still being defined, Corrent decoupled the core architecture of their security processor from the interface architecture to allow for easy migration to new standards as they develop. Further, their internal core is built to scale in performance, so from a silicon perspective, today's gigabit solutions easily migrate to OC-48 and OC-192 without modification to the core architecture. As a result, Corrent is well-positioned to deliver multiple high performance products to their customers over time.

### **Conclusion**

Synopsys Professional Services helped Corrent prove it could deliver high-speed security processors to eliminate security bottlenecks in high-speed networks. Synopsys worked with Corrent to optimize a critical and representative design module using Physical Compiler and to establish a new and complete RTL-to-GDSII design flow. The new flow combined with

Synopsys tools was integral to timing closure and successful tape-out of Corrent's complex encryption chips—seven million gate, 0.15 micron, 150 MHz devices. Corrent's designers are using the RTL-to-GDSII flow to develop Corrent's follow-on processors.

"We expected Synopsys to find out which of our problems they could solve and how, and do it in a timely manner," says Bhatnagar. "We asked them to take our designs through Physical Compiler; come up with a flow that integrates Physical Compiler into our methodology, and solve specific problems that came up in that process. In doing that, they were willing to work with us very closely in a number of areas."

"The Synopsys consulting contract helped us a lot," concludes Anand. "We will continue to look to Synopsys for support."

**For more information about Synopsys Professional Services, visit us on the Web at [www.synopsys.com](http://www.synopsys.com), call 1.866.537.6654, or contact your local Synopsys sales representative.**

The logo for Synopsys, featuring the word "SYNOPSYS" in a bold, uppercase, sans-serif font. The letters are black and have a slightly irregular, hand-drawn appearance. A registered trademark symbol (®) is located at the top right of the word.

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