

# Synopsys and Nitec

## Nortel Compresses Multiplexer Design Cycle with Board-Level Simulation

It pays to be first in the telecommunications industry, where today's advanced system may be obsolete tomorrow. Using Synopsys Professional Services' SDH and SONET verification solutions, Nortel is doing board-level simulation earlier in the development cycle to accelerate development of next-generation network products.

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Jim Whiteside, NITEC Advisor to the Board-Level Simulation Group

# nextwork

### Issues

- Meet critical time-to-market goals with thorough and efficient verification prior to first silicon
- Eliminate errors and speed verification of standards compliance
- Shorten ASIC and FPGA design cycles

### Solution

Early board-level simulation using:

- Synopsys Professional Services' SDH and SONET Telecommunications Workbenches
- Synopsys Smart Model® Library
- Synopsys LM1400 Hardware Modeler

### Benefits

- Reduced manpower requirements for validation with significantly faster test generation and analysis methods
- Improved product quality and robustness through verification of standards compliance and interoperability
- Saved millions of dollars in lost sales by identifying multiple ASIC design problems prior to fabrication
- Enhanced debug capabilities for board-level simulations speed up product testing

## Business

The Northern Ireland Telecommunications Engineering Centre (NITEC), Nortel Northern Ireland's research and development arm, designs and supports optical networking solutions.

As the research and development arm of Nortel Northern Ireland, NITEC specializes in synchronous digital hierarchy (SDH) transport, access and broadband products which comply with standards of the European Telecommunications Standards Institute. This constitutes a global market opportunity of more than 160 countries and includes customers among the major players in telecommunications, such as British Telecom and Cable & Wireless. Among NITEC's accomplishments is the TN-16X STM-16 multiplexer, the SDH version of the North American OC-48 Transport Node. In addition, the facility is responsible for evolving Nortel's TN-1X STM-1 multiplexer transport system, one of the first SDH transport systems in the world. There are now more than 10,000 TN-1X and 1,000 TN-16X systems in service.

# digital

### Managing Relentless Time-to-Market Pressure

"In the telecommunications market, new products need to be developed very quickly," says Jim Whiteside, the NITEC Advisor to the Board-Level Simulation Group. "We need to hit the market fast with the right product at the right price." This is difficult, since designs are increasingly dense and complex and standards are continually evolving, adding to the complexity. At the same time, the window of opportunity for introducing new products keeps shrinking.

"The major technical challenge we face is to create rugged products, in terms of manufacturing, yield and reliability once they are in use," says Whiteside. "Our primary business challenge is to get to market quickly and to compress the design cycle by getting the ASICs, hardware and software right early in the design cycle before fabricating the silicon and cards."

To help meet these challenges, NITEC relies on the SDH and SONET Workbenches from Synopsys Professional Services. These Workbenches, the first commercially available verification tools of their kind, provide accurate and easy-to-use simulation models for testing and verifying compliance of ASICs and other system components to telecommunications standards.

NITEC uses the SDH and SONET Workbenches to automate the creation of long, complex simulation test cases for verifying the behavior and function of ASIC designs when they reach the RTL and netlist stages. "The SDH and SONET Workbenches provide the designers an absolute, maintained standard for verifying their designs. The test cases are hierarchically constructed and require very little effort to produce comprehensive vectors," explains Whiteside.

### **SDH and SONET Workbenches Enable Early Board-Level Simulation**

NITEC also uses the SDH and SONET Workbenches, along with Synopsys hardware modeling tools and the SmartModel library of behavior simulation models, to test ASICs in board-level simulation. "We put ASICs we're developing into board-level simulation before we sign off on them," says Whiteside. "We do as much board-level simulation as we can, because that's very often where you find the problems. Simulating how the ASICs will act when stimulated by models

of all the other ASICs in the system gives us better accuracy earlier in the design process." NITEC tests minimum timings, maximum timings and typical timings to simulate the temperature on the board. If everything works correctly under all three conditions, they are confident about the design. In fact, the cards they design using board-level simulation are very rugged, with yields approaching 100 percent.

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# transport

The SDH Workbench prevented costly rework on a highly complex ASIC development project. Board-level simulation detected a pointer-processing problem in a section overhead processor for an STM-4 multiplexer. "If we had not found and fixed the problem before fabrication," says Whiteside, "it would have set two projects back for three months, put the projects at risk and cost us millions of dollars in lost sales."

Using board-level simulation, NITEC also quickly identified a problem, caused by a third-party ASIC, which had already

shipped. When a multimedia product was upgraded with the third-party ASIC and a NITEC-developed FPGA, it didn't function properly. Two teams searched for the problem for three months without success. Then NITEC came to the rescue. "Here at NITEC, we ran a board-level simulation, updated it with the new ASIC and FPGA data and solved the problem in just one week," reports Whiteside. "The SDH Workbench and board simulation form a powerful debug tool because of signal visibility and ease-of-use in probing down through the ASICs/FPGAs to find a problem."

### **The Expanding Role of Board-Level Simulation**

Because of its success with board-level simulation, NITEC is expanding its operations and will have about ten people dedicated to the task by the end of 1998. For a new multiplexer project, a board-level simulation engineer has been assigned to the development team from the outset. As designers encounter design issues, they can run tests to simulate the problem. Once a specific problem is recreated in simulation, it is easy to solve. "It is uncommon, if not unique, to

develop a full board-level simulation so early in the design cycle, but this process saves us time and money," explains Whiteside.

NITEC is also looking to board-level simulation to shorten the development cycle through hardware/ software co-simulation. Programmers can write software code using a co-simulation tool and the board simulation, which is available long before the prototype ASICs and boards.

### **Conclusion**

The SDH and SONET Workbenches from Synopsys Professional Services enable NITEC to do early board-level simulation, which speeds the development of quality products in an increasingly competitive industry. "Telecommunications components and systems have become increasingly complex. The Synopsys SDH and SONET Workbenches give us great visibility into our product designs and functions through board-level simulation," concludes Whiteside. "Eventually all boards with FPGAs and ASICs will be designed, using board-level simulation, because they are becoming too complex to be developed using a scope or logic analyzer."

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