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Predictable Success

Synopsys and InterDigital

InterDigital Designs Standards-Compliant, Flexible HSPA Solution Using SPW Tool and Models

For InterDigital the design process determines our success. We needed a modeling methodology covering the needs of the entire interdisciplinary team. We relied on Synopsys' algorithm design solution to put this rigorous process in place."

InterDigital®

Robert Peloso, Director, Engineering Management, InterDigital

Business

InterDigital Communications Corporation (IDCC) takes breakthrough wireless technologies from innovation to implementation, contributing to wireless standards that help drive the industry forward. InterDigital holds a strong portfolio of patented technologies, which it licenses to manufacturers of 2G, 2.5G, 3G, 4G and 802 products worldwide.

Challenges

- Achieve a robust, predictable state-of-the-art implementation within time-to-market window
- Optimize the algorithmic solution for highest performance at lowest power
- Minimize the need for algorithmic revisions during system integration and platform performance validation

System-Level Design Solutions

- SPW algorithm design tool and models

Benefits

- Get results faster with the fastest simulation
- Access to high quality WCDMA and HSPA model libraries and experts
- Easily reuse complex models across different versions of the tool
- Gain a significant competitive advantage in the 3G wireless market

Overview

High Speed Packet Access (HSPA), or Release 6, is an advanced evolution of the third generation (3G) wireless standard for cell phones. HSPA offers true broadband performance with data rates of up to 14 Mbps downlink and 5.76 Mbps uplink, putting stringent requirements on the design of the modem IP core and wireless subsystem. Today IP cores for HSPA are frequently needed to augment the design efforts of wireless companies that have specialized in newer standards such as LTE.

Based on this standard, InterDigital offers the SlimModem Digital Baseband (DBB) Core solution as a complete hardware and software IP package that includes a dual mode, 3GPP Release 6 compliant 2G and 3G physical layer paired with a complimentary dual mode protocol stack implementation.

Early in the process, we saw the benefit of teaming up with the Synopsys wireless developers. Their experience and familiarity with the standard, combined with their amazing turn-around time, made them our extended project team."

William Lawton, Sr. Manager, Systems, InterDigital

Compliance with the HSPA standard requires high levels of performance across different modulation and coding schemes that must adjust dynamically to changing RF conditions during data transfers. Once the algorithm is specified at a detailed level and performance is proven through simulation, the implementation process needs to ensure that all details of the implementation can be verified against the golden reference model.

Leading Algorithm Design Solution

SPW has been used for many years at InterDigital. As part of the HSPA project, Synopsys helped InterDigital implement its high-performance polymodeling methodology by providing all the necessary assistance and support for simulating their complex HSPA models.

Polymodeling enables InterDigital to utilize predefined, well understood, modeling building blocks which can easily be taken as the reference for the RTL designers at a later time. A very important feature of these models is the ability to selectively switch from floating-point simulation to fixed-point simulation.

"Polymodeling is a big thing. I have heard horror stories about going from floating point to fixed-point implementation. Once we could 'flip the switch' using SPW, this was easy!" says Ken Bartsch, Member Technical Staff Modeling and Verification, responsible for the HSPA ASIC verification.

To help meet the time-to-market window for the HSPA IP core, InterDigital needed a solid modeling infrastructure and the ability to easily reuse complex models across different versions of the tool. The company also needed faster simulation. SPW provided exactly this.

Previously, InterDigital used in-house, untimed C modeling for reference modeling; however, manually maintaining the model scheduler would cause numerous problems with model reuse, especially for multi-rate designs. Since flat C-code does not resemble any hardware structure, it could not be used as a reference model for bit accurate algorithmic verification. Also, quality control would suffer, since coding style could not be enforced.

After evaluating several algorithm design vendors, InterDigital selected SPW. SPW provided InterDigital with ultra fast specification of the algorithm using model-based design featuring C data flow (CDF) polymodeling support.

Because the project required combining simulations covering billions of test vectors from multiple team members, InterDigital decided they needed a more robust and mature tool. SPW's strict methodology and its features tailored for multi-user designs enabled the entire design team of 20-30 engineers to efficiently cooperate, versus the single-user concept of other tools. InterDigital was able to increase productivity and accelerate time to market.

High-Quality Models and Excellent Support

In order to maintain competitiveness in the communications space, InterDigital needs to quickly produce technology with the latest communication standards, such as WCDMA, HSPA, and LTE. The quality of Synopsys' model libraries and the expert knowledge from the model developers made a significant difference. InterDigital engineers could focus on their design, while relying on the availability of a ready-to-use simulation testbench reflecting the non-differentiating features as defined in the latest standard.

The HSPA IP solution was successfully introduced and quickly gained significant momentum in the market. With this project behind them, InterDigital is well on its way to developing the next-generation of wireless technology.

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