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Synopsys and Space Systems/Loral

Space Systems/Loral Selects Trusted SPW Tool for
Advanced Satellite Receiver Design

> *SPW's fast simulation runtime is critical to keeping up project momentum and reducing overall development time. The ability to design an optimal signal processing algorithm in the shortest amount of time with less effort is the most significant benefit SPW offers."*

Charan Langton
Manager of Simulation and Analysis, Space Systems/Loral

Business

Space Systems/Loral (SS/L), a subsidiary of Loral Space & Communications, is one of the world's premier designers, manufacturers and integrators of powerful satellites and satellite systems, providing solutions that meet the requirements of an international base of commercial and governmental customers.

Challenges

▸ Speed design projects to continue to aggressively deploy satellites on schedule
▸ Improve productivity in algorithm development with a model-based design approach

System-Level Design Solution

▸ SPW algorithm design tool and SPW Model Libraries

Benefits

▸ Faster results with simulation time reduced by more than 90 percent compared to other approaches
▸ Easy deployment in compute clusters to parallelize simulation iterations
▸ Extensive high quality signal-processing model libraries and source code
▸ Intuitive and easy-to-use graphical interface between blocks with model-based design

Overview

The Simulation and Analysis team at Space Systems/Loral releases up to nine high-power satellites per year, all including signal processing receivers designed with SPW. Committed to delivering the highest performing satellite transceiver systems on a reliable schedule, the small development team needed an easy-to-use, effective design approach. SS/L selected Synopsys' SPW tool, which they used to model, simulate and verify the algorithms for the satellite receivers.

Like terrestrial communication systems, satellite-based communication faces the demand of ever-increasing bandwidth requirements. More complex modulation and encoding schemes are required to achieve this goal, resulting in significantly higher complexity of the physical layer algorithms. Having access to a library of thousands of building blocks accelerates the time to a first algorithm description, and therefore time to first simulation. Additionally, the increase in algorithm complexity directly translates into longer simulation times per test case, plus a larger number of test cases that have to be covered. So overall simulation performance becomes a key factor in meeting the project schedule.

> *Synopsys' SPW is the best simulation tool available. As long-time users of SPW for algorithm design, we were confident that we would see reliably fast runtimes every time."*

Charan Langton
Manager of Simulation and Analysis, Space Systems/Loral

Leading Algorithm Design Solution

The development team deployed SPW in three different stages of the development process, the concept, design and testing phases. During the concept phase, the team used SPW to develop an initial simulation model of the design. During the design stage they developed a floating point representation of the signal processing functions. In the testing phase they used SPW-based simulation to resolve any anomalies that presented themselves.

The design team wanted to accelerate their design and verification of complex signal process algorithms. SPW provides an intuitive and easy-to-use interface between blocks along with a common simulation and verification environment with a model-based approach, enabling diverse teams working on a single project to get system-level simulation results faster.

SS/L also wanted to avoid the potential problems that result when multiple designers working on individual blocks of a single design need to merge their components back into the larger design environment. SPW offers hierarchical model management and version control systems that easily handle this concern. By isolating the design environment of each team member while still making the entire design transparent to individual developers as well as larger design teams, SPW enables net gains in overall project productivity.

High-Quality Models and Support

The quality and breadth of Synopsys' model libraries and the expert knowledge of the model developers greatly eased the design process while ensuring high quality of results. With access to more than 3000 highly parameterizable models available in source code, the team was able to focus on differentiating their complex algorithmic concepts, using the variety of built-in standard data types. "The source code availability for the models was a distinct advantage," said Charan Langton, Manager of Simulation and Analysis at Space Systems/Loral. "By primarily using the SPW library models, we were able to concentrate on quickly developing some of our own custom models using SPW source code as the starting point." This flexibility combined with the dedicated fixed point simulation optimization feature enabled simulation performance that far exceeds that of other model-based approaches.

Scalability

SPW's load-sharing feature enabled SS/L to take advantage of their multicore servers, with parallel simulations fanning out through the compute cluster. SPW also made it possible for each user to automatically start as many simulations from his or her SPW interface as their hardware would allow.

Based on their long experience with SPW and the ability to quickly turn around design analyses, SS/L plans to continue to use the SPW tool for their future programs.

> *"SPW's extensive model library, complete with source code, accelerated our design, simulation and verification process by giving us the ability to use models 'out of the box' or quickly create custom models.*

Charan Langton
Manager of Simulation and Analysis, Space Systems/Loral