Leading RF Solutions Firm Significantly Reduces Simulation Times and Simulation Failure Rates for Complex Laminate Designs and Corners Processing
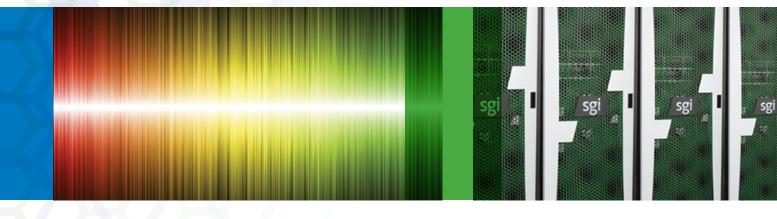
Implementation of SGI® UV™ 2000 Greatly Increases Productivity by Providing Enhanced Compute and Memory Capability.

Background Information

Organization:
Qorvo

Location:
Corporate Headquarters in Greensboro, NC and Hillsboro, OR

Field:
Semiconductors and Electronics Design

Overview

Qorvo (Nasdaq: QRVO) is a leading provider of core technologies and Radio Frequency (RF) solutions for mobile, infrastructure and aerospace/defense applications. Qorvo was formed following the merger of RFMD and TriQuint, and has more than 6,000 global employees dedicated to delivering solutions for everything that connects the world.

Qorvo has the industry's broadest portfolio of products and core technologies; world-class ISO9001-, ISO 14001- and ISO/TS 16949-certified manufacturing facilities; and is a DoD-accredited 'Trusted Source' (Category 1A) for GaAs, GaN and BAW products and services.

The Challenge

Qorvo's electromagnetic (EM) simulation users range from novice, infrequent, to advanced. Providing a simple method for generating simulations for this variety of users poses significant challenges. Moreover, the diversity of designs these users simulate such as complex semiconductor die and laminates offers an additional challenge.

Upon introduction of the initial simulation process flow it was discovered that laminate simulations required a specialized process flow to increase system resources. Complex laminate simulation projects can consume multiple IBM® Platform™ LSF® (Load Sharing Facility) grid servers and an average of eight to twelve hours or longer of processing time. The goal for these projects was to provide increased capabilities on a per day basis and to reduce processing time for basic and complex laminate EM simulations.

A secondary goal was processing different layout versions of a nominal design in a few hours rather than days. Engineers usually manually generate 12 to 16 different layout versions and sequentially simulate each layout one at a time. This process can take several days and the goal was to reduce days to a day or less.

The Solution

ANSYS® HFSS™, the industry standard for simulating 3-D full-wave EM fields, was deployed by Qorvo engineers. Because most phases of their simulation typically consume a large amount of memory, significant computing power and time was required. For Qorvo's complex laminate EM projects, the simulation process was conducted in two phases: 1) the meshing/adaptive solution and 2) the distributed frequency sweep point solution using ANSYS Electronics HPC. For "process corner simulations", the solution used ANSYS Distributed Solve (DSO) with ANSYS Optimetrics™ capability to simultaneously execute design variations while consuming just one set of application licenses.

To achieve faster processing times for complex laminate designs and "process corner simulations" the use and number of parallel processing is leveraged. A greater number of parallel processes achieves faster results. To accomplish the above goals using increased parallel processing SGI proposed a High Performance Computing (HPC) system of:

- SGI® UV™ 2000 with 16 Intel® Xeon® processor E5-4650V2 – 10c/2.4Ghz (160 core)

- 2 TB of System Memory

- SGI Management Center

- SGI Performance Suite

- Customized job submission script using Altair's PBS Professional® job scheduler

Results & Benefits

Complex simulations pose a number of problems that traditional EM software and Qorvo's LSF grid clusters could not address adequately.

Issue #1: Qorvo's LSF environment requires the user to specify how much memory is needed to run the job. If the user underestimates the correct amount of memory, the simulation will (prematurely) terminate resulting in lost productivity.

Issue #2: Restrictions on the physical system memory would reduce the number of parallel processing that could be run.

The SGI® UV™ 2000 system addresses both of these issues. Two terabytes of system memory —users are not required to specify memory — results in no lost time in re-running the simulation, or provides the option to run more parallel processes to reduce processing time.

The SGI solution has enabled Qorvo to move beyond the traditional, standardized simulation approaches that cannot fully address the challenges involved in simulating complex laminate designs or "process corner simulations". Qorvo can now:

- Run EM simulations uninhibited by simulation failures caused by under-specified LSF job memory needs.

- Schedule simulations regardless of the user's skill level because PBS Pro implementation allows for a simplified environment.

- Reduce EM large memory simulation processing times up to 50% or more. Simulations that took 8 to 12 hours to complete are being accomplished as quickly as four hours.

- Reduce simulation times for "process corner simulations" up to 85%. Simulations that took 20 hours to complete are finished within three hours.

- Run EM simulations free of memory constraints.

The Qorvo, SGI and ANSYS Software Partnership

SGI hardware technology enables Qorvo to gain maximum benefits from the mix of ANSYS software it uses during the complex process of electromagnetics simulation.

Qorvo has developed a simplified simulation environment using ANSYS® HFSS™ software specifically for the design of complex laminates and semiconductor die designs.

For "process corner simulations", Qorvo has developed a process flow using the inherent abilities of ANSYS HFSS 3D Layout with ANSYS Optimetrics. Qorvo and ANSYS have also developed a process to auto-generate defined nominal layouts (optimetric-defined designs) that are typically done manually.

All the above software runs on the SGI® UV™ 2000 system.

About SGI

As a recognized market leader in high performance computing (HPC), SGI offers solutions for the most demanding challenges. SGI develops excellent systems in the fields of technical computing, big data and cloud computing.

With experienced partners across a strong network, SGI supports the development of efficient and high-performance solutions to meet the requirements of each individual customer.

With its qualified experts, SGI can advise its customers on applications of any level of complexity and provides a comprehensive customer service to meet the highest demands.

For more information, please contact an SGI sales representative at 1-800-800-7441 or visit sgi.com/contactus.

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