

Panel:

When Will the Analog Design Flow Catch Up with Digital Methodology?

Chair: Georges Gielen, Katholieke Universiteit Leuven

Organizers: Mike Murray, Mike Sottak, Lynda Kaye

Abstract

Despite the fact that more and more electronic design is comprised of analog and mixed signal content, the design flows and methodologies in this area are lagging behind the pace of innovation in digital design. For sure, analog designers are in shorter supply, but this only makes the need for improvements and efficiency that much greater. Only of late have we seen production-worthy attempts at functions such as analog synthesis and optimization reach the market. What is needed in today's analog design flow? What are the key technologies that are missing? How does the existing 'food chain' need to work together to drive greater efficiencies?

A distinguished panel of suppliers and users assemble to discuss, analyze and predict.

Position Statements

Mar Hershenson

Barcelona Design, Inc., USA

In order to meet the System-on-Chip challenge, the industry must find a way for analog design to keep pace with logic design. The current state-of-the-art for analog design – design, simulate, adjust, repeat – is very time consuming and relies heavily on designer experience. With analog designers in short supply and accelerated SoC development cycles due to analog and logic's co-existence on the same chip, the industry faces a potential crisis. An automated analog flow – one that starts with Verilog-A models, and results in industry standard output formats like GDSII that can be integrated into chip layout tools – is the only way for the mixed-signal, System-on-Chip revolution to become a reality.

Ken Kundert

Cadence Design Systems, USA

The key to improve analog design productivity and efficiency lies in the ability of the design organization to be able to develop and deploy a "systematic design methodology", not in tool automation alone. Top-down analog design is one such methodology and systematic methodology means applying the chosen design methodology with a well documented and structured process so that communications between design engineers and between design steps are as efficient and error-free as possible. This also allows for re-use because of the "intent" of the previous design is captured.

Philippe Magarshack

ST Microelectronics, France

The art of analog design needs to become a deterministic science in order to allow the development of analog components of SoCs within schedules compatible with today's markets. For this to happen, there needs to be EDA tools and methodologies for analog design, at the level of the digital solutions of today. ST Microelectronics is actively pursuing partnerships in this area with Universities and EDA start-ups, and will provide its view of the state-of-the art and the directions needed.

Akira Matsuzawa

Matsushita, Japan

Real analog circuit synthesis is the key to catching up with the digital technology. Three to five years from now, almost all the systems including digital and analog will be synthesized automatically. We will be able to use the system – after inputting the needed circuit function, specifications, the order of priority, process parameters, and design rules. We can obtain preferable circuit scheme, optimized circuit parameter, layout, and test program or these candidates to select. Wide varieties of circuit topologies, complex optimization methodology, difficulty with describing the circuit function and specification and poor simulation power make analog synthesis very difficult. However 90% of analog circuits would be composed with reusable and selected function blocks, and the practical description of functions and specifications also to clarify the circuit optimization are not fundamental technical issues, but issues of time or effort.

Ronald A. Rohrer

Neolinear, Inc., USA

Few companies can continue to spend the time and money needed to design complex ICs one device and one rectangle at a time, yet this is what dominates as "methodology" in most analog design groups. Our digital colleagues combat the complexities of their designs with synthesis tools; we design by hand. The analog community no longer has the option to hand craft every design; there are too many designs to do, and not enough designers to do them. To survive, we *must* catch up.

With the right top-down, correct-by-construction methodologies, utilizing a comprehensive and well characterized set of configurable building block components, analog circuit designers need not give up much, if any, area or performance at the lowest level of design. As the digital design community learned more than two decades ago, giving up low level "freedom" can lead to large productivity and performance gains at the higher levels of

design. It need not take another twenty years for analog circuit design to follow that path.

To catch up, we need analog synthesis tools. These tools must (1) retarget quickly to *arbitrary* new designs and technologies, (2) support *full* capture, archiving and reuse of the constraints that practicing analog designers insist on, (3) support a full *front-to-back* solution, with automatic circuit and physical synthesis, and (4) integrate *seamlessly* into the custom design flows with which circuit designers have historically been most comfortable.

At Neolinear, we have developed robust front-to-back analog synthesis tools that reuse designers' existing circuit verification flows to guide synthesis and validate the final circuit result. These tools have been applied to a wide range of commercial analog circuits, with 2X to 10X time savings. Analog synthesis has been regarded as an unlikely—if appealing—fantasy for a long time. Today, it is here, it is real, it works. Tomorrow it will be a core component of all analog design methodologies.

Ping Yang
TSMC, USA

Increasingly, designers are targeting communications products to leading foundries for fabrication. It is TSMC's constant goal to shorten the design-to-volume timeline -- and often the analog portions of communications designs are in the critical path of that timeline. We hope to see a day shortly in which analog automation increases speed and predictability in time-to-tapeout, and first-pass success in silicon.