Shifting Left with ANSYS

In 2017, Synopsys® and ANSYS partnered to take the best of ANSYS' power integrity and reliability offerings and create an integrated flow with Synopsys implementation to drive robust design optimization. Following the release of RedHawk Analysis Fusion by Synopsys in 2018, customers have shared positive feedback on productivity and design quality impact that have helped drive further

John Lee and Jacob Avidan

innovations on this platform. We sat down with John Lee, vice president and general manager of the semiconductors division at ANSYS, and Jacob Avidan, senior vice president of signoff products at Synopsys, to get their views on the results of this collaboration and how the ANSYS–Synopsys collaboration helps address the challenges of emerging technologies.

Question: Can you share what industry trends you are seeing?

John Lee: 2018 was a great year for a number of market segments, with strengths in 5G, artificial intelligence (AI), high-performance computing and automotive. We expect them to be key industry drivers in 2019.

Jacob Avidan: I agree. Last year we saw growth in semiconductor innovation with strong momentum into 2019. There was tremendous growth in the AI/machine learning sector. Growth of 5G and augmented reality/virtual reality in gaming and industrial sectors is creating interesting new opportunities. And autonomous technologies, for example, are driving the need for higher reliability. Of course, there are also other traditional sectors too, like mobile, data center and high-performance computing.

Q : What do you see as some of the emerging technology trends?

JL: From a business view, we are helping to address significant trends and challenges related to power and reliability in 7nm and below process nodes, ultralow voltages of operation and multiphysics reliability issues in advanced packaging, such as 3DIC.

JA: In addition, the transition to 5/3nm and beyond, as well as the low-voltage dynamics and yield robustness associated with them, has been a big jump and a learning experience for customers. With respect to

power rail analysis, more attention has been given to design robustness and reliability for an increasing number of companies, especially at lower nodes. Power integrity issues are increasingly included as a primary concern rather than an afterthought. This is a bigger concern as more companies are now exploring 3DIC designs.

Q: What kinds of design challenges are inherent in these emerging technologies that might be more difficult to address?

JL: The list of issues customers care about from our collective customer base include:
- Electromigration/power integrity (EM/IR) signoff — this is becoming as challenging as timing signoff
- FinFET thermal and reliability issues
- Process variability
- Timing closure
- Margin management
- Power grid design challenges at 7nm:
  - A 5-times increase in grid complexity, compared to 16nm; power grids have 10B-plus nodes.
  - Razor-thin margins in 500 mV ultralow voltage computing with severe variability.
  - Increased power noise scenario coverage for greater signoff confidence to achieve the desired Fmax (maximum frequency) on silicon.

JA: The design challenges resulting from EM/IR can no longer be addressed at the very end of the design cycle. EM/IR needs to be thoughtfully built into the design

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process right from the beginning. "Shifting left" is required to drive the right methods into the process. Our recent announcement with Fusion Compiler is a big part of that vision. Giving power to the block designer to not only analyze but also fix issues early in the design cycle at the block level before full-chip integration has provided significant productivity benefits.

Q: How does RedHawk Analysis Fusion address some of these key challenges?

JL: Enabling RedHawk Analysis Fusion earlier in physical design flows helps designers achieve a 5-times increase in productivity and faster convergence during signoff with better quality of results using ANSYS' industry-standard power integrity and reliability analyses. Leveraging signoff-quality solutions during the in-design phase provides early visibility into design issues and allows them to be fixed up front. Specifically, innovative placement, clock tree synthesis and post-route IR-driven optimization strategies have enabled users to reduce manual work and maximize design robustness through IR recovery. Recently, designers were able to eliminate 95 percent of IR drop violations using RedHawk Analysis Fusion on a large graphics processor design.

JA: In-design rail flow enabled by RedHawk Analysis Fusion allows the physical design engineering team to easily run the RedHawk engines under the hood and automatically deliver signoff-quality results back to IC Compiler™ II for fixing. This drives better decisions for achieving power, performance and area goals early. Also, thermal reliability is a key concern in FinFET designs. By enabling self-heating analysis during in-design, physical design engineers can analyze and fix reliability issues earlier by doing thermal-aware EM checks.

Q: How is the ANSYS–Synopsys relationship progressing?

JL: We are excited about our progress and momentum addressing advanced-node needs with RedHawk-SC, built on ANSYS SeaScape, the world's first custom-designed big data architecture for electronic system design and simulation. All of ANSYS' 7nm customers are using RedHawk-SC for power integrity signoff with great feedback, and it is enabled for RedHawk Analysis Fusion for in-design IC Compiler II optimizations.

JA: Great! As we deploy our new Fusion Design Platform™, our customers are excited and look forward to achieving even better results with EM/IR integration into the flows.

Q: Can you share some customer highlights resulting from this partnership?

JA: Customers have given great feedback on the benefits this partnership provides, primarily in two areas. The first is the ease of use of in-design rail analysis that enables physical design block designers to do IR analysis work early and avoid surprises down the road. Second, the most important component is the IR-driven optimization opportunities we are giving customers using the industry signoff-quality data — including full automation beginning from placement. Customers have reported amazing results, as mentioned earlier, and we look forward to their continued success and being a part of that.

It has been an exciting journey collaborating at the engineering level with ANSYS, customers and foundries, and it has produced great innovation and customer results.

JL: I agree — we have seen our mutual customers benefit from this great relationship in driving faster schedules and building in a scalable model for best design robustness. In fact, our customers have taken this relationship a step further — they are driving initiatives and working closely with us on adjacent applications to further drive the benefits.

Q: Any closing remarks?

JL: There are plenty of opportunities for more technology innovation, and we have an exciting pipeline. Stay tuned!

JA: We look forward to continuing our synergistic partnership and innovating solutions to delight our customers!

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