The Shaughnessy Report in PCB007

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Andy: Hi. I'm Andy Shaughnessy. Welcome to the Shaughnessy Report. I'm speaking with Brad Brim. He's the product Marketing Manager for Sigrity. How are you doing Brad?

Brad: Very good Andy. Thanks for hosting me.

Andy: Sure. No problem. I saw that Sigrity just released a new version of their SpeedXP signal integrity suite. Why don't you give us a run down of the developments with that tool?

Brad: Sure. We're quite excited about some of the new capabilities and hopefully our users can put them to application immediately. Our SpeedXP Suite is actually a suite of individual products that work closely together under a common environment. Those products are Power SI, SPEED2000, PowerDC and a utility called Broadband SPICE. They are all applied for signal integrity and power integrity applications.

A number of improvements that we made would start with things like customizable workflows. This is for high end users who are highly experienced that would like to tailor a workflow for themselves with fewer buttons to push … a little bit of automation mixed in. Or, for support of new users, we provided a set of tailored workflows that guide the user through a very powerful general product but guide them on how to do their simple design tasks as they are getting starting. So that's pretty exciting in terms of ease of use.

Another thing we have done is what we call Model Connection Protocol. There is a trend in the industry toward system level design that would connect multiple boards or maybe a package model to a board model for a bit more detailed analysis. You really don't want to wire up SPICE netlists because you might be connecting a package with a thousand pins. That's very error prone but also very tedious. So through this header connection protocol, that interconnect between the models can be done very automatically.

Something else we noticed is that users were experiencing very large data files for their results. There is a standard out there called Touchstone format which been around for many years. It is ASCII format. It's very space consumptive. It's become a standard. We created a new broadband network data set called BNP. We're actually working with the folks at Synopsys to incorporate this into HSPICE.

So what we're looking at is both efficiency for reading in large sets of data but also size efficiency for sending data to your colleagues across the country via email. So that's a pretty significant step forward. To support this, since it isn't really a standard, we pulled out the post-processor from one of our tools and we provide that online on our web site as a free downloadable viewer. It does a few things like allow you to reduce the data and things like that that are very nice.

Andy: Right.

Brad: Another way that we work with external data is we've also implemented a direct import of netlists and even options and simulation parameters from generic SPICE or HSPICE netlists. So when you come into a Sigrity tool you can use many of the previously developed models or netlists that you've got already.

A capability that we've improved is (EMC). It's been something we've done in the past but as industry demand has grown we've improved our EMC or some people call it EMI. So … electromagnetic compatibility or electromagnetic interference. We've improved some capabilities really focused on board designers in that area. You can look at, for example, a near field scan to see where the hot spots are on your board where you might be leaking energy. You can also look at how much energy comes off of a board. This is key because you want design side consideration rather than trying to do it by measurement verification at the end. That's always when products are most visible to management and you don't want to do some design spins just because you leak too much energy off of the board.

So those are some of the major improvements we've made in our release 8.0 of our SpeedXP Suite.

Andy: Right. So, obviously I guess these improvements were made at the request of the users. What sort of trends are you seeing that are driving tool development at Sigrity?

Brad: Well, obviously we're a design automation company so automation is really our key. And that automation includes doing things that are tedious for the user but it also includes analysis engines and things like that which enable the user to consider new effects or high speed signals. And, I guess the biggest trend is probably increasing data rates whether it is parallel busses or serial data channel busses … higher speeds … greater system size. That's probably one of the driving factors.

And, also in terms of … you'll hear buzzwords … one is SSN or simultaneous switching noise. Some people call it simultaneous switching output. And, what that is … that's really a mix of signal integrity … so the electrons flowing down a printed circuit trace on the top of your board but it blends itself with how you have resonances on ground planes in your printed circuit board. Because after all, measuring a voltage is really between two points … between that signal line and the ground plane. And, if your ground plane is bouncing around, so is your signal line. So, that's a very important trend that we've seen especially with higher speed channels and also the high switching current that you see in high speed serial data busses in FPGAs and things like that.

Andy: Right.

Brad: And talking about simultaneous switching noise and larger system size … we talked a second ago about some of our improvements. We called it Model Connection Protocol or MCP. What we see is a lot more people looking at system level design and not just board design or not just chip design. What that means is I've got to connect this electrical model from one domain, for example board, to a package and I have to wire up a thousand pins. And, I will make a mistake. And, it will take me a half hour to do it or longer. So these connection protocols are starting to become common. Even in the IBIS, community there is some discussion currently about making some standard connection protocols.

We created one that is open and we will share it with other vendors and with customers who can implement it. It currently connects all the different parts of our tools for both chip and package and also for package and board. But, the system level design is really where people are headed aside from just individual domains.

Looking at system design, what we've noticed is power integrity design specifications. For example, you buy a graphics chip or a chipset for a processor from a vendor. They want to make sure that chip set works in your board or your system. What they do is in the past they've given you very specific design guidelines. "You shall put on seven .1 microferret capacitors and you shall put on xyz decoupling capacitors and they should located as close as possible to the chip, etc." Well those are very specific but they're obviously over robust. The reason why is because that vendor doesn't know what system you're going to be using. You could have 8 FPGAs on a board. What that implies is you're going to be drawing a lot of power. So the design guidelines that they provide have to work in every environment. So, for a simple environment they are overly robust which means overly expensive.

Andy: Right.

Brad: Sigrity has a tool that we introduced about a year ago called OptimizePI. What it does is it characterizes the power delivery network across boards and across packages or a combination. It helps you balance performance and cost. In other words, if I implement a system based on these design guidelines, I can go back and differentiate myself based on cost by analyzing and having an analytical basis for reducing my

decoupling capacitors. Or, I can differentiate myself on performance by boosting the performance of the overall system. That tool has been accepted by the industry very well. It's not just new and inexperienced users but also some of our most senior users have adopted it for the explicit consideration of cost.

And, what's happening in the industry is there is trend right now away from specifying highly detailed like "you shall place the seven decoupling capacitors here". And what they are saying is "look, what I need is a 10 milliohm impedance between DC and 200 megahertz. As long as your power delivery system from the board side meets that then my chip set will work on your board". It seems a little more general but it allows you a lot more freedom to select and place the decoupling capacitors wherever it benefits your system.

Andy: Right. Because it is not going to be the same for everyone's system.

Brad: Exactly. And the people who provide the design guidelines now … everybody knows they are overly robust and they take all kinds of heat because a person designing a low end system doesn't need it and they complain because it's too expensive

Andy: Right. It's like over constraining at the board level.

Brad: Yeah. That's a good way to describe it.

There is another trend that's not so obvious to a lot of people, unless you've gotten hung up in your FCC qualification at the end of your product for EMC emissions. And that is EMC, electromagnetic compatibility, or some people would call it EMI for electromagnetic interference. There is a trend now towards more design side consideration of EMC. What I mean by design side consideration is you can follow your design rules about decoupling capacitor placement and don't run nets over split planes and all those sorts of things when you do your board designs. But, you don't quite know if your board is going to be better or the same as the last board that you built. And, when you stick it in a metallic enclosure and when you hook up coax cables and all that sort of stuff there are a lot of unknowns that you don't control for emissions.

Our customers have been approaching us and asking for an EMC design flow for printed circuit boards. For an EMC design flow, that's a difficult one, because there is no EMC flow out there. There is not much for us to implement. But what we can do is augment PCB design by allowing customers to look at how much energy does this board radiate? What if I change my clock traces around? What if I look at spread spectrum technology and I put different signals on my existing clock traces? How much energy is radiated? Where does it go? And, where are the hot spots on my board? We've improved significantly in that area.

Another thing that has become very clear to us at Sigrity is since there isn't an EMC design flow out there and it's difficult for a board designer to really be considered in an

EMC flow. What we've done is we've partnered with CST, Computer Simulation Technologies, from Germany and they have a significant presence in the US. They have a 3D EM simulation technology that's very focused on EMC. They've customized their UI and their simulation engine. What we do is we look to them for an EMC based design flow. They can consider things like radiation from a heat sink or how do the vent holes in my pizza box enclosure effect the radiation from my system?

Sigrity ties into that directly because the printed circuit board inside of that enclosure is obviously the source of the emissions. What we do is we link to their detailed analysis tools by providing the information of how the PCB with its signaling sources is the source for that radiation. In combination, these two sets of tools actually provide a very good EMC centric design flow. But from the printed circuit board designer, he really doesn't have to become an expert. Someone can give him high level guidelines like "reduce your emissions by half." If in dB you're talking about emissions of power you may be talking about 3dB. So reduce your emissions by 3dB. With Sigrity you can go in and do that by looking at some very simple post processing. We're pretty exciting about enabling board designers to do that.

I think those are the major trends we are seeing we are seeing driving our product development.

Andy: Alright Brad. I certainly appreciate you taking the time to talk with us.

Brad: Thank you very much Andy.

Andy: I've been speaking with Brad Brim. He's the Product Marketing Manager for Sigrity. I'm Andy Shaughnessy of the Shaughnessy Report. Thanks for listening.

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