Data divide looms for fabless chipmakers

THE IC INDUSTRY faces a 'digital divide' because critical physical information about chip manufacturing is becoming more important but, because of its sensitivity, only a handful of customers of foundries will be allowed to see it, according to speakers at a panel on manufacturing challenges at the Globalpress Electronics Summit in March.

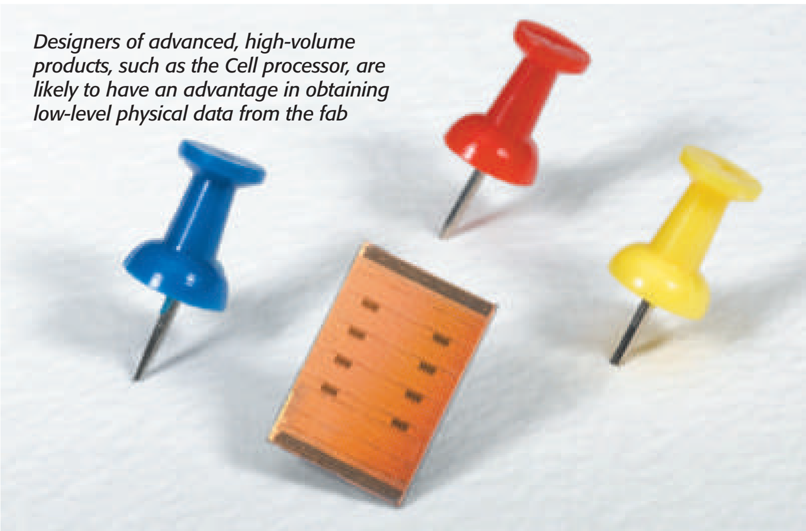
Leading-edge designers will need to be able to check how manufacturing techniques such as optical proximity correction and reticle enhancement alter the electrical characteristics of the devices they are working with.

"The more you can do to understand from an electrical point of view what is going to happen when the design hits manufacturing, the better," said Ted Vucurevich, chief technology officer, advanced research and development, Cadence Design Systems.

"The challenge is going to be that a lot of the information which is necessary during design time for that to be validated is very sensitive information on the foundry side, in terms of opening up the kimono about the way the process behaves," he added. "So there is going to be an interesting challenge in the foundry model of being able to have sufficient information on the design side and the foundry side to be able to have a smooth transition going forward."

Daniel Gitlin, senior director of technology development for processes at Xilinx, said: "There is going to be a selective group of leading-edge companies that really get a look at all the details who will design with that, and a larger group who will follow with lagging technology. The amount of detail that has to change hands and the confidentiality and nature of the information is such that the foundry companies will restrict it to large leading-edge companies that require those technologies."

Dr John Martin, vice-president of strategic alliances and partners, of foundry company Chartered Semiconductor, said: "If additional information is available and necessary for the success of our customers we would certainly share that information. We've been expanding our design rules and models for transistors and interconnect. I'm sure there'll be further expansion as we move forward to more aggressive technologies."



Designers of advanced, high-volume products, such as the Cell processor, are likely to have an advantage in obtaining low-level physical data from the fab

One way the problem might be solved is to encapsulate process correlation techniques and data exchange within tools.

Vucurevich said: "Certainly this is happening within IDMs [integrated device manufacturers]. There have always been logical and physical diagnostic teams that are able to put information back in from a flow or modelling perspective. Typically that is where it happens, where you go back and say 'we didn't model something right or we didn't have the rules right' and so the next time you go through the design process you get it right. For high-yielding designs we are now seeing the introduction of test diagnostics that can be run on the tester and bring back data that can be correlated."

Martin said his company is looking at the issue the other way around, by trying to make the processes more design friendly. "We have four large development teams providing ideas for modifying process technology to make it more functional and to alleviate the problems, and all the design teams producing products for those companies are using that data," he said. "We also have partnerships for process control and that data is shared, so there are expanding ecosystems around particular technologies that allow much broader access and utilisation of data."

Kevin Meyer, vice-president of marketing for Chartered, told *Electronics Systems & Software* that there is a problem in providing yield information, "in that it

depends on the sophistication of the customer. People at the leading edge of the technology who hired people to understand those issues tend to be from the IDMs." He said that Chartered would provide yield information to customers on a case-by-case basis, but that, ultimately, some of the important information would be passed up in the libraries.

The Silicon Integration Initiative (SI2) has been working on a data model to provide yield and other physical information to designers, but Steve Schulz, president of the group, told *Electronics Systems & Software* that SI2 is working on building standards that use available encryption technologies to allow foundries to pass the yield data securely to customers. However, he said it is unlikely they will make the data available widely, but will sign bipartite agreements as necessary.

Although designers may be able to use low-level yield information to tweak designs, Eric Filseth, vice-president of marketing for IC implementation at Cadence, said designers will move to using it in a broader way: "You will need to deal with yield earlier in the flow, before physical synthesis or layout. People are going to want to know whether, if you increase the die size and use fewer metal layers, you will get better placement. Once you are doing block-level placement, it is too late to make a big difference."

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Critical software needs a change in approach says Ford CTO

THE CHIEF TECHNOLOGY officer of carmaker Ford, Richard Parry-Jones, has called for changes in the skills that engineers use to solve complex systems-engineering problems and which will mean changes in the way companies build software for safety-critical systems.

Parry-Jones made his comments at the recent Lord Austin Lecture at the IEE in Savoy Place as he described the issues that Ford is facing: "For the last hundred years, we have been mainly using mechanical systems. The next hundred will be dominated by electronics. Electronic control is reaching like tentacles throughout the vehicle. That is leading to a significant proliferation of software."

He said that many traditional methods of building complex control systems made them fragile. "We are not very skilled at statistical engineering. Japanese engineers, however, are very skilled at it." He said the Japanese engineers were trained in using inductive as well as deductive reasoning when designing systems: "The inductive approach is very good at revealing systems that have complex behaviour." He added that European and US schools do not teach these skills well: "Inductive skills are missing in the graduates we hire. They are illiterate in inductive skills."

This will be a problem, he said, in an environment where engineers need to be able to work with highly complex interactions. The distributed software environment envisioned for tomorrow's cars introduces so many potential failure modes in a system that traditional scenario-based approaches to protecting against them will not work. "There are so many more potential interactions and distributed functions do not have a single owner," said Parry-Jones. "Software engineering is to mechanical engineering what quantum theory is to classical physics."

The company is moving to use more model-based development to build virtual prototypes before moving on to actual coding, an approach that has been used extensively at the Volvo subsidiary. He said Western companies should borrow another approach from Japanese carmakers: more extensive reuse. "We have to design fewer new parts and do a more thorough job up front when we do design new parts," he added.

However, Parry-Jones insisted that software could prove much more powerful at dealing with hardware failures in the field if it was adaptive enough, by adding the ability to move software functions around microcontrollers in the vehicle as needed.

Richard Parry-Jones