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The future of SoC from the tenth hole

The ever widening complexity of system-on-chip requirements is blinding designers to their final objective, writes David Manners.

The semiconductor industry is in the same position as a golfer standing on the 10th tee at The Belfry golf course, according to Ray Bingham, president and CEO of Cadence Systems. The problem posed by the 10th hole is that: "You can't see the destination from where you're starting," said Bingham, "it's the same thing when you're designing a chip."

During last year's Ryder Cup at The Belfry, the victorious Europeans adopted a different tactic to the Americans. "The US players, laid up, chipped, and hoped for one putt," said Bingham, "with the Europeans, one part of the matchplay team went for the hole, while the other part laid up and chipped."

The chip industry has to be similarly innovative in its approach. "It's requiring a different way of thinking about things," said Bingham, "I don't think anyone remembers a more difficult time."

In both the Ryder Cup chip design, the stakes are huge. "Designing an SoC [system-on-chip] takes one year and costs \$20-25m for 60-70m gates", said Bingham, who was speaking last week to the Annual Electronics Forum organised by Future Horizons in Vilamoura, Portugal.

Then comes the problem of trying to make it on an unpredictable process. "Everyone has been surprised at how difficult 130nm has proven to be," said Bingham.

Agreeing with Bingham, Susumu Kohyama, senior v-p at Toshiba, said: "Yield predictability is very difficult but it is essential for time-to-market and time-to-profit". He instanced a huge problem with modern process technology: "Deep sub-micron requires a material change with each generation," said Kohyama.

To Kohyama the industry seems in trouble: "Neither the IDM (integrated device manufacturer) model, nor the fabless model, is working, and the Taiwanese foundries are starting to suffer," he said.

"Projects are failing, not because of physics, but because of complexity," said Chris Hamlin, chief technology officer of LSI Logic, "it will not be possible to return to high levels of shipments of products, to millions of people unless, and until, we solve the problems of ease of use, transparency and predictable management of complexity."

So complicated, expensive, and unpredictable have SoCs become that customers are abandoning them.

"System companies are moving away from Asics, although they achieve the

highest performance," said Mark Pinto, v-p and general manager of Agere Systems' processing, aggregation and switching division, "now they need to reduce cost, so there's an increased use of standard product."

Agreeing with Pinto, Roger Blethen, chairman and CEO of tester company LTX, said: "Moore's Law has almost run aground. ICs are so complex there's a new world order in which only a few firms can fabricate them."

What's more, it's all going to get worse. "At 65nm it will cost \$5m for a mask-set, \$10m for a lithography tool, and \$5bn for a fab," said Professor Karl Joachim Eberling, senior v-p for research at Infineon Technologies.

Funnily enough, everyone knows how to solve the problem. "You don't want to develop ten different chips for ten different applications, you want to design a platform that can scale to different applications, with different protocols and service," said Agere's Pinto.

Toshiba's Kohyama has been pushing the platform idea on the Japanese semiconductor industry for years. "Platforms allow you to minimise the design effort for each individual design - otherwise customers can't afford to pay," said Kohyama.

In this respect Europe led the way with the early 1990s MEDEA programme which developed various platforms to be used by Siemens Semiconductor (latterly Infineon Technologies), Philips and STMicroelectronics.

The man who headed up that MEDEA programme is Jurgen Knorr. "At higher levels of integration, platforms - meaning something which several companies can use as the basis of their products - are clearly the answer," said Knorr.

However, although the platform approach has underpinned the market success in SoC of European companies, it has also caused trouble between them as they undercut each other in the market, beat each other to design wins, and pass on technology to other companies. Great technology does not solve the problems provoked by human nature.

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