



Big opportunities in MINIMIZING MANUFACTURING VARIABILITY

Walden C Rhines, chief executive officer and chairman of Mentor Graphics, talks about changes in the industry and technology issues.

TODAY, 85% of all GSM (global-system-for-mobile)-communication phones include a Mentor Graphics operating system, so it is safe to say that the company plays a critical role in the front end of electronic design. However, the inroads the company has made into improving the space between design and manufacturing are just as important. Walden C Rhines, chief executive officer and chairman, takes a high-level view on the current issues involved in running an EDA company and recognizing key areas for growth.

➤ **What are your top technology issues, and how is Mentor Graphics dealing with those issues?**

At Mentor, we try to look for where there are things that are nonlinear, and, because of the way we structure our business, we don't have to worry so much about the incremental. We have general managers who run their businesses, who stay in close touch with their customers; they have complete responsibility and resources to start and stop product development and to support innovators in their organizations.

There are two places where, at a corporate level, issues arise. One is where you have things that transcend multiple businesses where a strategy or direction is needed to tie them together. The other is in the area of discontinuities. In total revenue, in any given year, the discontinuities are small contributors because it takes so long for things in EDA to mature into products.

➤ **From a management perspective, how do you navigate changes in the industry?**

From a high level, we make changes in management or organizational structure with a longer time constant than the time constant of innovation to success, meaning that, if you shuffle the organization every three or four years, then you never know who to blame and who to reward. We try to put more stability in.

➤ **What product areas are growing in EDA?**

New applications, including ESL [electronic-system level], RET [reticle-enhancement techniques], and DFM [design for manufacturing]. There are a lot of system-level opportunities in automotive, aerospace, military, system-design optimization, system simulation, embedded

direct them. Then, you won't get into the new businesses.

➤ **How is multicore technology affecting what Mentor is doing?**

Our customers design more multicore products, so that creates a bunch of issues for simulation, particularly for transaction and other ESL-based simulation, because there are architectural trade-offs, and they involve software, hardware, and system-design trade-offs. The software must be developed in such a way that it can be optimized, which is pretty hard if the hardware is designed first, and then you try out the software. But if you can deal at a higher level of abstraction—for example, we have customers, systems companies, that use our UML [unified modeling language]. Basically,



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➤ **How does EDA grow?**

EDA grows only through new applications. Existing markets very quickly saturate—in relatively brief periods of time—in seven to 10 years maximum. Most of the growth in EDA comes

software, and verification. The problem is: If you just take your established businesses and let them grow in the space where the customers are driving them, the customers know where their problems are, and they will

they write an executable specification for the whole system before they ever decide what's going to be in hardware and what's going to be in software and then can do trade-offs and experiment.

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The other side of where multicore affects us is our own tools. The frequencies that processors run at have basically flattened, so most of the improved performance has to come from either more efficient code that we develop with whatever flexibility we have internally or getting the code to take advantage of multicore, which is where the largest share of performance improvement has been in the last five or six years.

➤ **What are the biggest customer demands today?**

It depends who you are selling to, what you are selling, and what you are trying to develop. Today, the emphasis on design has increased because fewer of the companies in the world control their own wafer fabs. It used to be that, if you wanted to build a better product, you could vary the process, vary the design, and

vary the system architecture. Now, in general, companies use standard processes, so more and more of their differentiation and value have to come from the design. That differentiation used to be very much performance and cost, and now it is very much power ... but less emphasis on die size and more on power and performance.

➤ **What do you want Mentor to accomplish in the next five years?**

Very broadly, of course, I want Mentor to be best at whatever we do so that we do provide tremendous value to our customers. In terms of where we go to from here, in the next five years, we're going to have the opportunity to be the principal value provider in the shrinking of design rules because the lithography is not going to change much. It's going to be mostly the computational aspects of how

you do lithography. We're going to be the principal provider of value in capability through both power and complexity, and we're going to be the principal provider of cost advantage through yield and manufacturing-variability control.

The value that the industry provides is going to increase over the next five years, and the role we play in the semiconductor and systems industry will increase dramatically. We'll do much more of the tasks of a designer in a systems company—automotive, communication, or military aerospace—and we'll provide much more of the total value in a semiconductor or other electronic-component company than we have in the past.

➤ **How do shrinking feature sizes impact EDA?**

Each turn of the screw in feature sizes creates lots of op-

portunities for EDA. Manufacturing variability as a percent of nominal will increase with each of those steps, so there are big opportunities to minimize variability and improve yield. There will be new failure mechanisms that give a big opportunity in verification, so kinds of failure, reliability, other kinds of computer-architected redundancy, and other things will be designed into those products that we don't have to worry about designing or verifying today. Shrinking feature sizes are one big piece of where new technology opportunities occur. The other is the increasing system size that we can deal with: whole networks or complex system equipment—airplanes, cars, and trains—and attacking the whole issue of the electronic system within, as well as the enterprise problem of the factory floor, the engineering, the service, and support.

—Ann Steffora Mutschler