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Shrink-wrapping EDA
Altium Designer Changes the Rules

When I bought my first 10MB hard-disk drive, the salesman came to visit and even took me out to lunch. I was a freshman in engineering school and I was buying the $10,000 unit for my employer, a hotel chain, to use for storing reservation data. At the time, a purchase of that amount of mass storage was a major transaction, both for our little company and for our supplier. The disk drive, about the size of a modern desktop computer, was delivered and installed by a trained technician who spent an hour with us going over the operating procedures for the unit.

History sometimes repeats itself a generation later. Last week, my teenage daughter bought approximately twelve times that amount of mass storage from a Target store using her leftover babysitting money. Once inside her car, she opened the shrink-wrapped plastic bubble pack, removed the tiny SD card, and dropped it into her change purse for easy access. When she needs to install it, she'll pop open the door of her point-and-shoot digital camera, pull out the old card, and drop the new one in.

When I got my first engineering job after college, I worked for an EDA company that sold place-and-route software to semiconductor companies. Our system cost about $250,000 and our customers did lengthy and elaborate evaluations to be sure it could handle that phase of their electronic designs. We sent trained technicians to install and monitor the operation of our software, a million or so lines of FORTRAN that sometimes buckled under the weight of 10K gate ASIC designs.

History sometimes repeats itself a generation later. Last week, Altium Ltd. announced the availability of Altium Designer, a shrink-wrapped, complete EDA tool suite that can take complex, multi-million gate system designs all the way from concept through FPGA design and board layout. Altium Designer combines the capabilities of the company's DXP, Protel, Nexar, Circuit Studio,

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and CAMtastic product lines into one low-cost, integrated environment for the electronic designer's desktop. Protel and Nexar were each already highly integrated suites of tools, so the overall level of integration seems unprecedented in EDA.

Altium Designer is not about exotic algorithms, faster runtimes, greater capacity, or new capabilities not previously available to electronic designers. The star of this show is the level of integration itself. Altium Designer is the "Microsoft Office" of EDA - a complete set of electronic design capabilities that can be easily and inexpensively installed on every designer's desktop computer, facilitating every part of the design process from system-level hardware and software design through board level implementation.

Altium's explanation of the motivations behind Altium Designer are as intriguing as the product itself. "In the 1980s, the microprocessor revolutionized electronic design," says Nick Martin, Altium Founder and Co-CEO. "The flexibility and power of software allowed designs to be created in a new way, where large parts of a system's functionality could be created and modified on the fly, without redesigning hardware. We believe that FPGAs will create a similar revolution in design by dramatically increasing the amount of a system that can be made 'soft'."

Altium's tool suite is based on the supposition that designs will make increasing use of FPGAs, and that FPGAs with embedded processing capability will be the centerpiece of many systems, with complexity previously found on the board migrating into the more flexible FPGA part of the design.

The history of EDA tools bears out this idea. Early EDA tools were built around a board-centric (and processor-centric) philosophy, with an implicit assumption that the primary complexity of the system would be captured in a schematic of interconnected board-level components. The EDA tool systems that evolved around that model included sophisticated board-level schematic capture, component library navigation and maintenance, and PCB design and layout software.

The next generation of EDA tools were built around an ASIC-centric philosophy, with an implicit assumption that the primary complexity of the system would be contained in an ASIC, and thus captured in HDL descriptions of the ASIC portion of the design. The tool emphasis shifted to ASIC design, synthesis, simulation, verification, layout, and analysis. Board-level design was de-emphasized because complexity was migrating from the board onto the ASIC. The design and packaging of the tool suite reflected the change in

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the fundamental style of system design.

Altium reckons that we are now switching from a predominantly ASIC-centric design philosophy to an FPGA-centric one. If true, the tool requirements are dramatically different from those of the ASIC-centric model. ASIC-centric design is about risk mitigation, while FPGA-centric design is about productivity, efficiency, and time-to-market. While ASIC design teams were willing to pay almost any price for tools that would increase chances for first-silicon success, FPGA teams face no financial risk comparable to the ASIC spin, and are much less inclined to pay premium prices for tools. At the same time, FPGA design and designers are far more plentiful than their ASIC counterparts, as the barriers to entry are lower and many more companies can afford an admission ticket.

Boil all this down, and what is needed for the FPGA-centric model is a reasonably-priced, comprehensive suite of easy-to-approach, integrated tools that can work for a whole design team engaged in FPGA-based system design. Enter Altium Designer. Altium has combined their existing offerings for embedded design, FPGA design, board design, and CAM into one offering. Licensing options are available to restrict the functionality and price for engineers in various roles in the design team. The board layout specialist probably doesn't require full access to the embedded software development tools, and the software engineer won't be needing the Gerber files. Altium offers configurations aimed at various specialists, while retaining the notion of the tall-thin super-engineer who does everything.

Certainly this is not the first time EDA tools have been bundled into a package, even for FPGA design. What makes this one any different, and why does integration like this have any more intrinsic value in FPGA-centric design than in board-centric or ASIC-centric design? The key is in the soft nature of the FPGA, and the implications of that softness throughout the system. As integration levels have increased and more functionality has moved into the FPGA, the interaction between board, FPGA-based hardware, embedded software, and overall system design has gotten more complex. Pinouts change regularly on the FPGA design that impact the board-level schematic and layout. Hardware design changes within the FPGA affect embedded software. System-level changes ripple quickly down through the levels of design, and because rapid development cycles mean concurrent engineering, everybody's work affects everybody else. Integration, then, in the FPGA-centric design world, has a much higher value than in any of the previous EDA models.

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If we extrapolate the trend of the FPGA-centric system – complexity moves from the board and other devices into the FPGA itself. The board becomes essentially an FPGA with connections to the outside analog world. Most of the design team, then, is working within the soft-wired development space of the FPGA. An integrated tool suite that allows the team to coordinate their work in this dynamically changing environment becomes crucial.

It is also interesting and appropriate that Altium is the company leading the charge in this methodology. Altium (and their previous incarnation – Protel) was built on the philosophy of offering design tools to the mainstream designer. With the shift of the EDA-market focus to ASIC-centric design, the majority of electronic systems designers were left behind. The money and technology were all being poured into ASIC, where a relatively small number of designers participated. As ASIC has evolved, that club of designers has grown steadily smaller and more demanding, soaking up the lion's share of EDA technology development. Altium has wisely observed that the ASIC focus of the rest of the EDA market has left a vacuum in the mainstream, creating an opportunity for them to supply the remaining 90+ percent of the world's electronic designers.

Curiously, the only other companies aggressively pursuing this market segment, and betting on this methodology shift, are the FPGA vendors themselves. FPGA companies have long seen the need for single-source, integrated design tool suites that cater to the mainstream designer. Every FPGA vendor today supplies such a tool suite to all of their customers. There are three important differences with the FPGA vendors' approach, however. First, FPGA companies look to gain their return on investment from silicon sales, so design tools are only a means to an end for them. Second, FPGA companies' tool scope tends to be limited to the FPGA design itself. It does not extend up to system-level design, or down into board layout and manufacturing. Third, and most important, FPGA companies' tool suites are, by nature, proprietary and locked into each vendor's technology.

Because Altium is making their living on design tools, they must deliver value in the tools themselves. In the case of FPGA tools, the customer often works with the tools as a secondary consideration – a follow-on effect from choosing a particular FPGA device for their project. When tools are purchased on their own, however, the customer's expectations are much higher, and the EDA company has to deliver on that expectation in order to stay in business. Altium argues that there is also significant value in the vendor independence of their solution. Since their offering includes a great deal of vendor-neutral IP, it is possible to create designs using Altium Designer that are not locked

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into a particular technology or vendor. These designs can then be migrated to various devices as technology evolves. This capability can also be used to postpone the FPGA technology decision until late in the design cycle when requirements are better known. It is even possible to try out a design using different technologies to find out, in silicon, which device works best.

Altium's sales process looks a lot more like mass-market software marketing than typical EDA. Obviously, if you're planning to serve thousands or tens of thousands of customers, neither you nor your customers can afford to put a live-in applications engineer at each one. The sales and support process have to be streamlined, and the product itself has to be self-supporting and easy to approach. This is exactly what Altium has done with Altium Designer.

While you probably won't be picking up a shrink-wrapped copy of Altium Designer at your local software store anytime soon, this is as close as EDA has been to the approachability of consumer software products. If Altium's vision and timing are on target, Altium Designer could be a sign of a change in the dynamics and economics of EDA, and its use could change the nature of the typical electronic product design process. The day may come when every design engineer's standard work environment includes a PC with a comprehensive FPGA-centric design tool suite installed, in much the same way that most businesses now equip their office employees with e-mail, spreadsheet, word processing, and browser packages.

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June 7, 2005

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