Moving beyond integrated design tools

The future is unified - moving beyond integrated design tools

Today, electronics designers are increasingly moving functionality from discrete devices into the programmable realm. But in general the tools used to do electronic product development have not evolved to match our needs. Traditionally engineers have used a disparate collection of point tools to target board design, programmable logic design, and software development. The emergence of high-capacity FPGAs at relatively low cost, however, is blurring the boundaries between software and hardware and increasingly limiting the effectiveness and efficiency of a point tool approach to design systems, regardless of the superficial integration offered by such tool collections.

Altium’s answer has been to move beyond integration by offering the world’s first (and only) unified electronic product development system that allows engineers to take a design from concept to completion within a single application – Altium Designer.

Altium Designer allows you to optimize connections on an FPGA device at the board level to facilitate PCB routing, with pin changes automatically propagated back to the board schematics and FPGA project. This can significantly reduce routing lengths and crossovers, and result in better utilization of board real estate, lower production costs and shorter design cycles.

What’s the difference between an integrated solution and a unified system?

Almost every design tool company state that their products provide an integrated solution. Some systems even provide sophisticated automation between different applications that make the job of getting information from one tool to another easier. But in an increasingly soft design environment, one where hardware and software can be changed with equal ease, does this level of integration provide an environment that truly exploits the potential offered by soft-wired hardware?

Altium believes that we need to go beyond simple integration of the various point tools used in electronic product development and unify the underlying design processes themselves in order to really use programmable devices to significantly accelerate development.

Rather than a loosely-integrated collection of point tools, engineers need a single unified environment in which to create the physical platform for a product and develop the ‘embedded intelligence’ programmed into this platform.
To illustrate the difference that unification of design brings, let’s look at one problem faced by many designers when using large-scale FPGA devices. Some EDA vendors promote integrated FPGA to PCB systems that allow you to manage the transfer and synchronization of information about the programmable pins on an FPGA with the physical PCB layout that contains the FPGA. This is a good thing because FPGAs can contain several hundred pins that are completely programmable by the FPGA designer. Manually recreating this information within the associated PCB design environment can waste weeks of time for the board designer.

Altium Designer also provides I/O management and synchronization. But because it provides a unified environment, the PCB editor has full access to all information about the target FPGA, including its physical pin layout. The PCB designer can use this information to easily set up pin swapping information at the board level. The PCB editor can then make use of this swap information to automatically optimize the pins on the FPGA for easier board routing.

While integration between the FPGA and PCB design processes can save some manual synchronization work, it is only when you unify the two processes that you can truly take advantage of the pin reprogrammability of an FPGA to simplify the board routing process. Unifying the FPGA and PCB design processes lets you make use of FPGAs in an entirely new way – one that can simplify and shorten the overall product development process through cooperative layout optimization between the PCB and FPGA.

It’s not just at the hardware level that high-capacity FPGAs have the potential to revolutionize the way electronics design is done. They have the potential to blur the distinction between hardware and software and allow unprecedented freedom in changing crucial design architecture decisions much later in the design process. But to realize this potential, engineers need tools that transcend traditional point tool boundaries.

Consider the challenge of moving functionality between software and hardware. Several companies, including the FPGA vendors themselves, offer products that can compile C code into a form that can be used to implement functions in FPGA hardware. This is exciting because it allows software developers to accelerate software execution without having to hand-optimize sections of their code. But in general these ‘C-to-RTL’ products provide only limited integration between the software development environment and the FPGA design tools. So while programmers can create the basic FPGA hardware elements, they will need to understand the FPGA design process and tools in order to be able to implement their system – a significant barrier to most software engineers.

Because Altium Designer unifies FPGA design and software development, our new unified hardware/software compiler technology allows a C programmer to select functions to implement as FPGA hardware, and then easily implement and test the whole system without having to have any knowledge of the FPGA design process. Once again unification is the key to successfully exploiting the potential that exists within today’s electronic technology and devices. Within the unified environment of Altium Designer both hardware and software engineers can make use of the unique properties of programmable devices to accelerate their respective development tasks without needing specialist FPGA expertise or having to move into different tool environments.

Unification of the electronic product development process is a key and unique facet of Altium Designer.
The bottom line is that a point tool solution – regardless of how integrated it is – will not take the electronic product development industry into the future. The blurring boundaries between software and hardware and the march of technology in the area of programmable devices is changing the face of electronics product development, in much the same way that microprocessors did in the 1980’s. Navigating this new design landscape requires tools that unify the entire development process.

In simple terms, more functionality of an electronic product is moving into the soft or ‘embedded intelligence’ portion of the design, which spans both traditional software running on a microprocessor and soft-wired components implemented in FPGAs.

Electronic product developers are ultimately designing one product that marries this embedded intelligence with the physical hardware platform that supports it. The key to the future will be having one unified system in which to design the entire product. Only within a unified development environment can engineers, designers and developers approach design in a new way and harness the full potential that the emerging ‘soft’ design methodology has to offer. This in turn allows companies to develop and bring more intelligent products to market faster than ever before, and to remain competitive into the future.