

**SAME  
HARDWARE**

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**DIFFERENT  
APPLICATION**

*NO MORE  
SACRIFICING  
DESIGN  
INNOVATION!*





WHAT HAPPENED  
TO THE **FUN**  
PART OF ELECTRONICS  
**DESIGN?**

# DEVICE INTELLIGENCE ENABLES PRODUCT ‘ECOSYSTEMS’ TO BE CREATED, FOSTERING DEEPER RELATIONSHIPS BETWEEN SUPPLIERS AND THEIR CUSTOMERS, IMPROVED SERVICE EFFICIENCY AND QUICKER UPDATES.

Most electronic product designers are asking themselves that these days, concerned they need to know more about technology than they ever needed to know before. If that wasn't enough, larger industry trends like globalization of manufacturing and off-shoring are happening at unprecedented rates, leaving most wondering how to also contend with setting themselves apart from the crowd, reducing their investment and getting their product to market in shorter times.

Design methodologies and production environments today are still stuck in the past. The design manufacturing vision of twenty years ago was never intended for modern demands of short-production cycles and high variety – based on the specialization and division of functionality with little thought for future innovation or growth. Designers forced to lock designs to specific programmable chips for manufacture at the start of the process make critical decisions about the hardware without being certain about the performance of it. The non-recurring costs of development such as researching, designing and testing of new products, once an integral part of creating a product's innovative edge, now shift overall focus and effort more onto meeting time-to-market. Ironically, the results drive real innovation and growth out of the design process.

## PRODUCT INTELLIGENCE IS THE NEW FOCUS

This traditional approach of putting development of the hardware platform first with soft aspects built in and locked down isn't practical anymore, creating a false sense of security in time-to-market as an important product differentiator. Whereas value that does differentiate a product (i.e., device intelligence or 'IP') is effectively tied to a rigid platform, both being the most difficult and costliest design elements to change.

Instead, why not put the soft elements first and at the center of the development process? This seemingly simplistic paradigm shift creates a dramatic change of focus. By separating function from the fixed physical hardware, key elements of design are moved into the soft domain. No longer locked

into the hard domain, they can be abstracted to a higher level where the designer can suddenly approach a design task from the customer's point of view rather than having to make a decision about hardware configuration before it's even been decided what the product will do. A single view of the design is created thus covering all aspects of electronic design and not just one isolated part of it.

Soft IP focus opens the door then for other additional advantages such as bringing unification to the overall design process, allowing the benefit of technologies such as large-scale programmable chips, and moving beyond the current loosely integrated point tools and a paradigm of fixed and outdated options!

## SOFT DESIGN EXPANDS TO INCLUDE HARDWARE

FPGAs as embedded platforms with soft processors are gaining momentum as the basis of more versatile and reconfigurable hardware platforms. Becoming more popular as their capabilities rise, they're also easier on the budget. Expanding soft design of these platforms is including an increasing amount of what were once the hardware aspects. Intellectual property programmed into the soft design system is fast becoming the most valuable part of the design, giving rise to architectural flexibility, and smaller, more adaptable boards.

Device IP then that can be programmed into the system, rather than manufactured on the board, will offer the most advantages in this brave new world. Soft design can start before the hardware platform is designed. It can continue after the hardware is designed, and even after it reaches customers. From a long-term perspective, field 'upgrades' become possible, opening up a way for the customer to connect not only to the vendor themselves but also much bigger, electronic, ecosystems.

Complexities that once created the inherently difficult part of the traditional design approach (i.e., board design) are downgraded appropriately to something more manageable and focus is once again back on product differentiation and innovation instead of just 'survival drivers'!

# THIS NEW APPROACH PROVIDES LONG-TERM SUSTAINABILITY FOR ORGANIZATIONS BUILDING ELECTRONIC PRODUCTS...AND PERHAPS EVEN A LITTLE **MORE FUN** FOR DESIGNERS IN THE PROCESS.

Interestingly enough, the implications for a soft design centric approach of all electronic systems extends beyond even the software. Designers can compare performance benefits and trade-offs of different FPGAs without changing their design and without the commitment. Follow this thinking a bit further and we see that not only can the software be upgraded but also the hardware.

## **DEVICE INTELLIGENCE WITH OR WITHOUT HARDWARE DESIGN**

Perhaps the biggest driver for change is the familiar connectivity of 'everything to everything', which is so dramatically changing the role of technology in our lives. For example, you wouldn't need to look any further than a humble digital picture frame as an example to illustrate the need for creating device intelligence independent of the hardware. Lots of people have them and lots of companies supply them. Many digital picture frames can read their photos from memory cards or USB keys, but by adding additional connectivity and advanced graphics using a powerful unified design environment to upgrade the hardware's platform, a company could offer something more and extend the basic capability of the single physical hardware platform to include wireless digital streaming of photos and other content from hard drives or the Internet. Since the streaming occurs through the same functional interfaces, there is no need to change the hardware. In fact, it's better if it doesn't.

A similar example on a larger scale would be a broadband broadcasting company that wishes to provide more targeted advertisements to particular audiences and provide upgraded video quality as a part of improved services to their customers – differentiating themselves from competitors providing the same broadcasting communications. Of course the immediate result

is improved customer satisfaction, but the natural progression is that this solution provides the basis of connecting the customer to a larger ecosystem and opening increased potential for creating a long-term relationship.

It's worth mentioning that many areas of scientific research have long required both real-time signal processing power combined with FPGA-based upgradeable and modular hardware. Not only can these platforms handle moderate to high-bandwidth problems and computations, but rapid development and design reuse makes research easier. In a project involving laser optical time transfers, being able to deploy the latest technologies by changing hardware and equipment to match evolving research requirements allowed new projects to be launched faster, and the researchers to be more responsive to ever-changing design requirements – it certainly would not have been as easy on a traditional hardware platform and using conventional design approaches.

You may get a sense that one common theme weaving through all of this is that as device IP becomes more differentiated, hardware becomes less so. It's not hard then to imagine customized hardware soon becoming a remnant of past technology as more emphasis goes into sustainable design processes based on device intelligence that can deliver better results. A single hardware platform could effectively have multiple applications offering long-term design savings, inventory consolidation and the streamlining of production processes not possible with software alone.

Another repeating theme is that whole device development can happen in the soft domain. Device subsystems can be developed with or without the hardware dependency, separating function from the fixed physical hardware and deployed when needed. Rapid prototyping to develop a sense of how you would actually approach a design and the costs of production would be possible in the same amount of time that you would normally spend chasing up datasheets. Product lines can be more easily updated and extended, and existing projects can be reused, meaning fewer development hours. Hardware need only be built once and upgraded later.

Aesthetics and ease of use aren't to be overlooked either. Customers are demanding that products look cool and be desirable in addition to being functional. Interfaces need to be attractive and easy to use. Products need to connect automatically to related equipment and peers as connected ecosystems become the new norm for the future. Products need to be intuitive enough that capabilities can be explored without reading the manual, and to be easily updated soon after deployment.

An implied requirement of being able to deliver these kinds of systems is the ability to use state-of-the-art design tools that unify the embedded development process. More importantly, it means identifying a solution provider that has a strong commitment to innovation and continuous development.

## **THE UNIFIED DESIGN ENVIRONMENT HAS SUSTAINABLE MERIT**

When device intelligence comes first in the design process, it's possible to move away from old paradigms and towards device connectivity. Obviously some larger organizations, such as those that use medical imaging, have been successfully using electronic ecosystems for awhile. The idea isn't new, it's just been limited. But the clear suggestion is to bring this capability into the hands of every designer, and not just a select few. Why?

A man with short brown hair and a black t-shirt is smiling and holding a large, white speech bubble with a black outline. The speech bubble contains the text "BUILD THE BEST CUSTOMER EXPERIENCE POSSIBLE" in a red, handwritten-style font. The background is a plain, light-colored wall.

**BUILD THE  
BEST CUSTOMER  
EXPERIENCE  
POSSIBLE**

Because device intelligence and connectivity enables electronics designers and their organizations to create systems that provide longer-term relationships with customers in ways that go beyond improved services or expected upgrades. They only require the right design environment.

Can a single tool provide a single approach to all phases of electronics design? Exploring choices invariably leads to a design environment that also has a reconfigurable hardware platform built in for that crucial implementing, debugging and updating phase of development with freedom to experiment with various vendor devices and swap I/O hardware in and out. All the necessary tools for every aspect of electronic design would be included – processor-independent embedded coding and debugging, mixed schematic and HDL-based FPGA design and synthesis, as well as full PCB layout. Software engineers with only a basic understanding of hardware could use it. Hardware engineers could focus on designing and prototyping

unique elements of design easily because not only would the software be upgradeable, but the hardware as well.

Requiring only minimal effort then to move the final design to production, off-the-shelf, reconfigurable hardware platforms can become the deployment mechanism bringing products to market quickly and without the need for full, custom board designs. Take this one step further and embedded engineers can create designs in hardware and dynamically deploy their efforts to physical hardware without even having to go to manufacture.

No more sacrificing design innovation to meet development deadlines means focus once again goes back into building the best customer experience possible – providing real long-term sustainability for organizations building electronic products, and perhaps even a little more fun for designers in the process. ●

Published: Electronic & Computer Design World, China, July '08, EEPW, China, July '08, Electronics News, Australia, July 2008 and A3 Volt, Austria, September, '08