

DIGITAL INDUSTRIES SOFTWARE

Veloce proFPGA increases design efficiency and brings SoCs to market faster

The Siemens EDA tool provides a modular, scalable desktop prototyping platform for early software development

Executive summary

Electronic systems of all sizes are routinely being integrated into single integrated circuits (ICs). While the largest systems-on-chip (SoC) make headlines, there are numerous small and medium SoCs that must be implemented quickly and efficiently. Verification of these designs must include hardware, low-level software (operating systems and drivers), and application software. This verification requires three coordinated approaches. The Veloce™ family of verification tools includes the Veloce Strato emulation platform and the Veloce Primo enterprise prototyping platform, which focus primarily on the verification of hardware and its interface to low-level software infrastructure. These constitute two out of the three necessary verification vehicles.

Introduction

Many Hundreds of users



Desktop FPGA prototype



The needs of application software developers

Application software developers need a way to jumpstart their code long before silicon is available. This is the third approach necessary for bringing a complex system to market as quickly as possible. In addition to getting a head start on the development of complicated code, it can also provide an early view into any hardware issues that might be affecting higher-level software performance.

Because software tends to be developed in a modular fashion using a broad team of coders, each developer needs to be able to run their portion of code at any stage of software development independently of all of the other developers — ideally using a system on their desktop. This allows them to be more productive creating software without competing for emulation or enterprise prototyping resources. If portable, it also makes it possible to test the code in the field using real-world signal inputs.

These inputs constitute what is referred to as in-circuit emulation, or ICE. While detailed hardware verification has moved to virtualized inputs (while still allowing ICE), software developers have more confidence when they can use real-world signals at speed, without the need for speed bridges. That means the prototype needs connections to different I/Os where the I/O needs will vary by application.

Prototyping on FPGAs

Prototyping systems based on field-programmable gate arrays (FPGAs) have been around for many years. Some companies rely on commercially available prototyping systems. Yet those systems have often required a completely separate development effort to implement the hardware design in the FPGAs with enough performance to run application code.

The effort to port the hardware code has meant that the hardware had to be relatively mature before attempting a prototype so that hardware changes would not require significant effort when updating the prototype. That delayed verification of software, pushing out the final release date.

In many cases, companies preferred to design their own prototypes. This required even more effort, since the entire prototyping platform — I/Os, memory, computing and FPGAs — had to be designed in addition to the FPGA contents.

While every effort might have been made to create a platform that could be re-used for different projects, that re-use tended to be limited by the need to update the FPGAs for future designs since prototypes typically need the latest FPGA technology from either of the major vendors. Changing the I/Os available for a different design may even require the redesign of the prototype board.

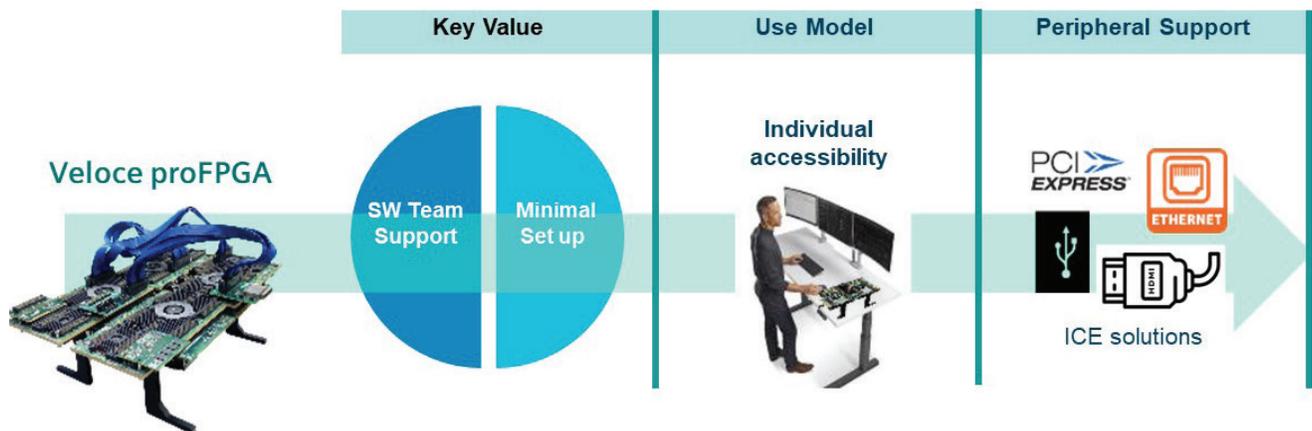
In short, then, whether off the shelf or custom, typical FPGA prototyping systems have lacked modularity and scalability. They have also been disconnected from the other verification tools, requiring significant effort to set up.

The Veloce proFPGA difference

There are four ways in which the Veloce proFPGA system differs from the prototyping tools of the past:

- Hardware compilation that is consistent with compilation for Veloce Strato and Veloce Primo systems
- Modularity and configurability
- Ease of set up
- Scalability

The Veloce proFPGA prototyping platform is explicitly designed to be a complement to the Veloce Strato and Veloce Primo platforms. This means that a hardware design can be conveniently compiled for any of the Veloce systems with minimal effort. In addition to making the development process more efficient, it also means that prototyping — and therefore software design — can start earlier, since hardware changes can be easily and smoothly ported to the prototype as the design matures.



The Veloce proFPGA platform is also highly modular. Specific FPGAs can be changed easily, making it much easier to adapt the platform to a new design with new requirements or to upgrade the FPGAs to a later generation without needing to redo the rest of the design.

This modularity can also simplify the integration of IP blocks into a design. During hardware verification, different teams may focus on different sub-blocks of the design. They will develop FPGA implementations of their hardware IP for verification.

When bringing these blocks together as an entire system that can be used to execute software, the pre-existing blocks can be imported at the bitstream level, ensuring that the implementation is identical to the verified hardware version and saving significant compilation time.

I/Os can also be easily configured for each design, making the platform usable for a wide range of designs simply by swapping in the needed I/Os at any given time. The work required to configure a prototype for a given design is minimal as compared to what is required for more typical prototyping platforms.

Set up is also straightforward, with a simple connection to a desktop PC and a standard wall plug. No special cooling is required, and the system generates little electrical noise that would interfere with other equipment.

The form factor means that it can easily be packed and moved from office to office, if needed, or be taken to a field location where the software can be verified in a setting consistent with what the final deployment will be.

Finally, the Veloce proFPGA platform can be scaled as needed for a given design. Versions are available with one, two, and four FPGAs. Given the modularity, different FPGAs can be used in different sites, allowing for a mix of FPGAs that more closely meets the needs of different parts of the design.

For larger designs, up to five of the four-FPGA boards can be connected for a total of 20 FPGAs — more than the typical 12 to 15 FPGAs needed for larger designs. Having that margin in place means more focus can be placed on actual verification of software rather than trying to squeeze the hardware design into limited FPGA resources.

Conclusion

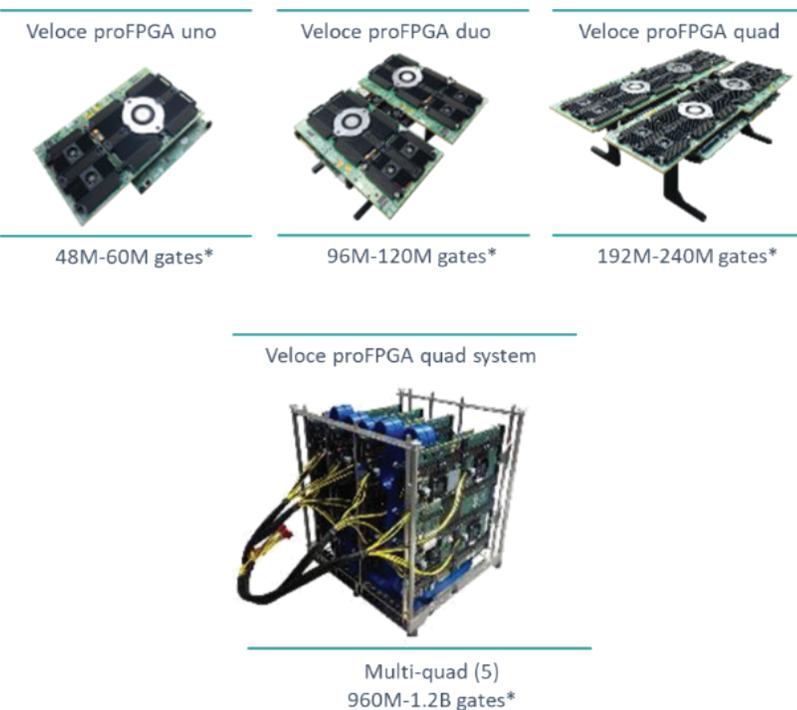
The Veloce verification triangle

The Veloce proFPGA prototyping platform completes the Veloce triangle. While hardware designers complete their verifications on the Veloce Strato and Veloce Primo platforms, application developers can get an early start on their code, knowing that any hardware changes will be easily implemented as they occur.

It is easy to configure for different designs by plugging in the specific FPGA and I/O modules necessary for any specific design. With up to 20 FPGAs available, large designs can be easily accommodated without expending significant configuration and compilation effort.

The Veloce proFPGA prototyping platform is no harder to plug in and fire up than any consumer box that might be connected to a PC. It can be moved around with minimal effort and with no effect on the design or verification results.

With hardware and software developers all verifying their respective portions of a system at the same time, and with minimal friction when moving between verification platforms, designs can be sped to market with the knowledge that verification of all system elements — including software — has been thoroughly completed.



*Capacity with Xilinx and Intel devices respectively

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