

# Synopsys and Altera

## Altera's SoC FPGA Virtual Target Enables Early Software Development and High Debug Productivity



*Being able to deliver a Virtual Target based on Synopsys' virtual prototyping technology is key to helping our customers address the growing software complexity in their SoC FPGA-based designs."*



**Vince Hu**

Vice President of Product and Corporate Marketing, Altera Corporation

### Business

Altera Corporation is the pioneer of programmable logic solutions, enabling system and semiconductor companies to rapidly and cost effectively innovate, differentiate, and win in their markets. Altera offers FPGAs, CPLDs, and ASICs in combination with software tools, intellectual property, and customer support to provide high-value programmable solutions to over 13,000 customers worldwide.

### Challenges

- ▶ Enable early software development
- ▶ Improve simulation performance over traditional methods such as emulators or hardware simulators
- ▶ Gain higher productivity for porting OS and developing drivers
- ▶ Offer customers a proven, reliable virtual prototyping platform

### System-Level Design Solution

- ▶ Virtual Prototyping Solution, including: tools, models, methodology and services

### Benefits

- ▶ Enable significantly earlier software development
- ▶ Reduce product development cost and schedule
- ▶ Improve productivity for the software team

- ▶ Provides comprehensive and proven technology
- ▶ Eased communications between global teams
- ▶ Provided significantly higher visibility and controllability for debug

### Overview

Altera used Synopsys' Virtual Prototyping Solution to create a virtual target of their new Cyclone® V and Arria® V SoC FPGA devices. The Altera® SoC FPGA Virtual Target is a fast functional simulation of a dual-core ARM® Cortex™-A9 MPCore™ embedded processor development system. This complete prototyping tool, which models a real development board, runs on a PC and enables customers to boot the Linux operating system out of the box. Designed to be binary- and register-compatible with the real hardware that it simulates, the Virtual Target enables the development of device-specific, production software that can run unmodified on real hardware.

Altera's software development teams and partners have used the Virtual Target to port operating systems such as Linux and VxWorks as well as develop complex device drivers. The teams found that not only did the Virtual Target enable much earlier software development, but also provided higher debug productivity.

## Leading Virtual Prototyping Solution

One specific software development team used the virtual prototyping technology to incorporate a Linux driver for two Ethernet controllers on the chip. The team lead said, "Using the virtual prototype felt like using hardware boards but was much simpler to set up; however, we quickly realize the additional power it delivers for visibility and controllability. This is unparalleled in any other realistic solution for software development." Because the team was familiar with the GNU tool chain, they were able to use the prototype immediately out of the box.

With the prototype's additional debug and analysis capabilities, the team quickly identified and solved software bugs. For example, while the team found a pre-existing Linux device driver, once they started it with the appropriate "ifconfig" command, the target appeared to hang. Since the hand appeared at different points in time. Using a traditional debug approach did not help them find the problem.

However, with the virtual prototype, the team quickly identified that the software was stuck in an infinite loop and that the Ethernet MAC was not generating the required interrupt. Because the prototype came with very good, built-in component documentation for the model, they determined that the PHY was asserting the interrupt but was never de-asserting it. On the real hardware, the team would not have been able to place a probe. Thus, they were able to solve this issue in a day or so with the virtual target instead of the weeks or month traditional methods would have cost.

Altera's software development teams also found that communications between their global development teams was definitely simplified. Because the virtual prototype provides consistent results when run under the same conditions, teams quickly ramped up on shared test cases and could report on problems in a common manner.

## High-Quality Models and Support

Altera chose Synopsys' Virtual Prototyping Solution because the technology is both proven and comprehensive. Synopsys was able to provide everything from a broad portfolio of models including the transaction-level models for the ARM Cortex-A9 processor, modeling expertise, a long history of experience in modeling a broad set of platforms, great training services, and the highly productive debug and analysis tools for multicore platforms.

With its virtual prototyping solution deployed at over 50 semiconductor and electronic systems companies, Synopsys was able to offer Altera methodology best practices, an extensive set of transaction-level models libraries, and tools that were easily fit into their existing software development flow.

These benefits were crucial to Altera's success in not only reducing cost and time for internal software development, but also in delivering the high quality Virtual Target to their customers to enable their early software development for the target SoC FPGAs.

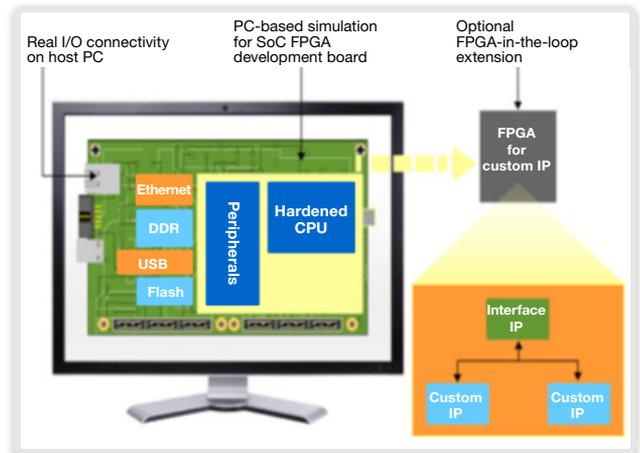


Figure 1: Virtual target with optional FPGA-in-the-loop

*"Our engagement demonstrated the proven expertise and experience from Synopsys' service and support organization in building and deploying virtual prototyping solutions."*

**Ying Sosic**

Sr. Manager, Embedded Software, Altera Corporation

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