

Xyron ZOTS IP Core Uses Virtex-II FPGA to Demonstrate RTOS Breakthrough

Xyron Semiconductor's zero overhead task switch technology gives a 40 MHz FPGA the real-time video rendering power of a GHz desktop microprocessor.



by William Dress
 Director of Strategic Development
 Xyron Semiconductor
 wdress@xyronsemi.com

Xyron Semiconductor's patented "zero overhead task switch" (ZOTS™) technology promises to revolutionize both hardware and software design for embedded systems applications. Essentially, we remove the task-switching and interrupt control decision-making off the core microprocessor – which dramatically improves microprocessor efficiency and provides end results similar to increasing a microprocessor's clock speed by several orders of magnitude.

Our technological breakthrough is novel and radical. Never before has RTOS task management been implemented in hardware in such a manner. We knew we could attract customers if we could just effectively demonstrate the technology. Fortunately, the functionality of the Xilinx Virtex™-II FPGA gave us the solution.

Show and Tell

We chose to demonstrate our technology by building on a public domain 32-bit RISC architecture. By introducing a simple, seven-task simultaneous environment containing real-time video, stored video, and real-time audio, we have been able to demonstrate a fully functional multimedia microprocessor that handles interrupts on a pixel-by-pixel basis. With Xyronium™ technology embedded into a 32-bit RISC processor as a firm IP core in a Xilinx Virtex-II XC2V1000 FPGA, our demonstration board runs at only 40 MHz. Nevertheless, the board processes full-motion, full-frame video and stereo CD-quality audio – with enough performance power remaining to manipulate video in real time in a moving picture-in-picture synchronized with the audio amplitude (Figure 1). To see an interactive Macromedia® Flash™ demonstration, go to www.xyronsemi.com/xdemo.shtml.

A similarly burdened standalone desktop microprocessor programmed with the same RTOS capability and without video, audio, or memory support architecture would need to run at over 1.0 GHz to accomplish the same real-time tasks.



Figure 1 - Special effects in real-time video



Figure 2 - Xyron Semiconductor Edison development board incorporates a Xilinx Virtex-II XC2V1000 FPGA.

Show and Sell

The Xyron ZOTS approach is so revolutionary that we anticipated the initial market acceptance might be difficult. Potential customers might have difficulty believing you can implement traditional RTOS software task management functions in hardware – and realize significant microprocessor performance improvements as a result.

Therefore, we created a powerful standalone, single-board computer that showcased our technology so users could see for themselves (Figure 2). Multiple video, audio, and user interfaces allow our customers the flexibility to design for any application in a familiar Xilinx FPGA environment.

Using a Virtex-II XC2V1000 FPGA, the development board is an ideal environment to not only illustrate the power of the ZOTS innovation, but also to implement these powerful new technologies in real-world applications. Once the Xyron ZOTS firm IP microprocessor core is inserted into the fabric of a Virtex-II device, there is ample room to create custom circuitry to support specific design requirements.

Conclusion

The path from demonstrating a radical new microprocessor technology to providing a practical development environment was optimized with the Virtex-II product family. The process only took a few months with a small design team.

In all fairness, we explored other options, but they were not nearly as efficient. Without the functionality of the Virtex-II FPGA, it would not have been possible to construct such a robust development board as the Edison™ Development Board. That's why Xyron Semiconductor has become a partner in the Xilinx AllianceCORE™ program.



In a classic win-win situation, combining Xyron technology with Xilinx products has given us the ability to realize standard-cell, dedicated IC performance in a flexible FPGA environment. The Virtex-II product offering has enabled Xyron Semiconductor to take its first steps toward becoming a full-fledged microprocessor company.

For more information on Xyron technology, please visit www.xyronsemi.com. To purchase a development board, go to www.xyronsemi.net. 