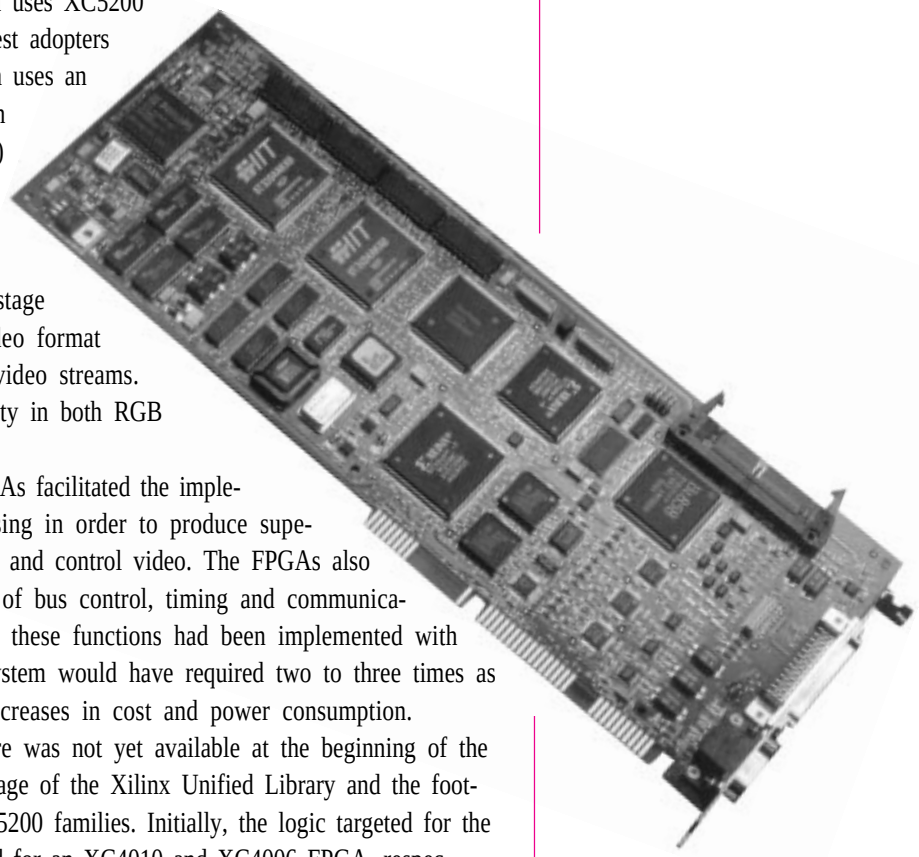
Videoconferencing
with XC5200 FPGAs

VTEL Inc. designs and manufactures high-quality, multimedia videoconferencing systems. It is the leading provider of videoconferencing equipment for the remote education and medical industries.

The VTEL systems are based on architectures that employ multiple heterogeneous processor subsystems, interconnected and controlled using custom data paths and control logic. Xilinx FPGAs provide a cost-effective, adaptable solution for implementing this custom hardware, and have been used in several generations of VTEL systems.

VTEL's latest videoconferencing system uses XC5200 family FPGAs, making it one of the earliest adopters of this new FPGA family. The new design uses an XC5210 and an XC5206 device (in 240-pin and 160-pin PQFP packages, respectively) to implement specialized video and communication data pipelines and control logic. The FPGAs contain custom video processing control logic with multistage data pipelines to perform high-quality video format conversions and the adaptive overlay of video streams. Video is processed at near broadcast quality in both RGB and YUV formats.



The flexibility of the SRAM-based FPGAs facilitated the implementation of custom video merge processing in order to produce superior integration of multiple streams of live and control video. The FPGAs also were used to consolidate a large number of bus control, timing and communications signal routing, and test functions. If these functions had been implemented with PALs and/or discrete logic devices, the system would have required two to three times as many circuit boards, with the resulting increases in cost and power consumption.

Since the XC5200 development software was not yet available at the beginning of the design cycle, VTEL engineers took advantage of the Xilinx Unified Library and the footprint-compatibility of the XC4000 and XC5200 families. Initially, the logic targeted for the XC5210 and XC5206 devices was designed for an XC4010 and XC4006 FPGA, respectively. Logic capture, simulation and printed-circuit board layout were completed in this manner. The designs were captured and verified on a Sun workstation using the Viewlogic PowerView schematic editor and ViewSim simulator. Altogether, about six man-months of effort were required to enter, simulate and implement the designs.

Once the XC5200 library was available, the conversion to the XC5200 family parts went smoothly. After some floorplanning of the data path logic, the automatic tools of the XACT- system produced an implementation that exceeded the performance requirements of VTEL's application.

The compatibility between the XC4000 and XC5200 families was exploited again during prototyping and initial system test. The XC5210 FPGA was available when the first

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Videoconferencing

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prototype systems were built, but the XC5206 was not, so it was replaced by the pin-compatible XC4006.

The anticipated improved routing capabilities of the XC5200 architecture increased the effective usable capacity enough to allow the inclusion of additional test functions during the latter stages of product development. This additional functionality significantly enhanced board-level product testing capabilities.

VTEL design engineer Richard Glass noted, "Xilinx has provided VTEL with excellent FPGA support through several generations of system designs. VTEL especially values the ease of development and flexibility of the Xilinx FPGA products, which facilitates rapid development and allows incremental design improvement over product life cycles. By using FPGA technology, we have been able to adapt the subsystem designs to meet changing market requirements both during product development and in the field." ◆