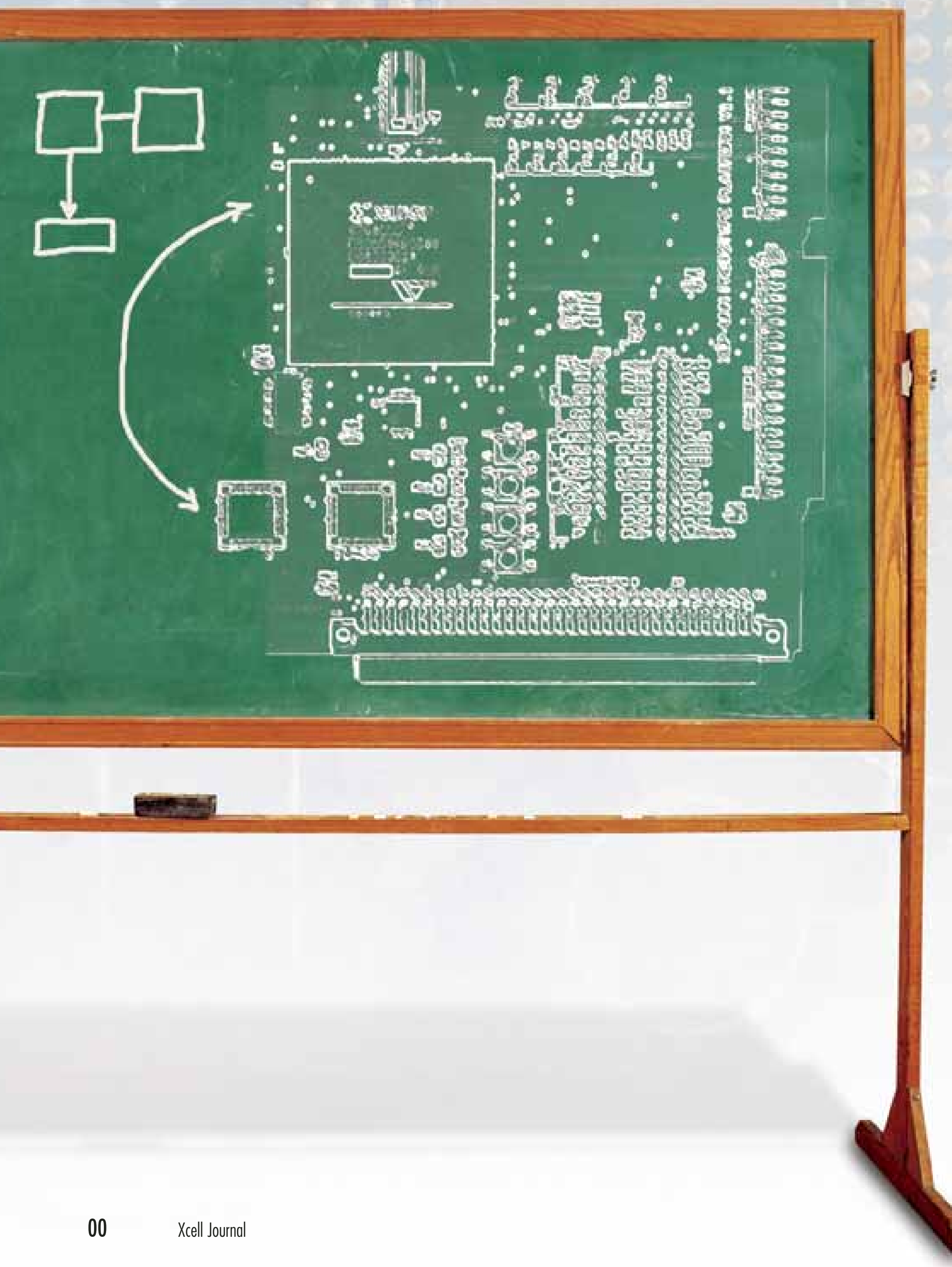
Board of Education

The UNM FPGA prototype project shows how the Xilinx University Program helps students learn about programmable logic.



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Both universities and corporations share a desire for students and engineers who can easily integrate into high-technology professions after graduation. Collaborative efforts are the key to developing the necessary skill sets.

One such collaboration is the recent Xilinx® University Program – University of New Mexico (XUP-UNM) prototype board project. When the XUP needed someone to develop a prototype board for donated Virtex™ 1000 devices, UNM jumped at the chance. The quality of this project clearly shows the high level of interaction between the local Xilinx facility, the XUP, and the university.

UNM students had to meet several key design criteria before beginning the project. The most important was that they had to design the board using donated Virtex 1000-BGA560 FPGAs. These million-system-gate devices are ideal for university projects. Their functionality and size make them suitable for a wide range of projects with the Xilinx Integrated Software Environment (ISE), System Generator, or Embedded Development Kit (EDK).

Project Requirements

As shown in Figure 1, the primary goal was a platform on which students could complete entire projects, as well as one that would allow easy interfacing to multiple external options for increased capability.

Another requirement for the prototype board was to allow a maximum number of inputs and outputs; students need to be able to get signals into and out of the board. Where possible, it was beneficial to interface with Digilent™ series circuit cards already available.

Because Digilent input/output boards are available to schools through the XUP donation program, this allows students a wide range of input and output options by switching between plug-in modules.

The board provides a multitude of output connectors:

- Standard 40-pin 0.1 inch connectors on Digilent I/O boards, which make it possible for students to obtain low-cost push pins that allow interfaces to logic analyzers and other test equipment.
- Hirose 140-pin connectors that mate to the new high-speed bus (HSB) series of Digilent boards, featuring memory and analog-to-digital conversion.
- Standard 96-pin connectors that allow basic interfacing to a 6U-VME mounting platform.
- Standard 9-pin serial and 25-pin parallel connectors and their associated interfacing devices.

A nice feature is the ability to switch the 25-pin connector between enhanced parallel port (EPP) and JTAG modes. By flipping a switch, students can JTAG program the board using a standard parallel printer cable. This is a very useful feature in a student environment because it allows professors to mount the boards in a stationary position; students can program the board without vertically mounting a programming cable to the header pins, reducing the possibility of the header pins breaking off.

From an academic standpoint, another great benefit is the placement of dual FPGAs on a single platform. The design team connected 100 pins from one FPGA directly into the second FPGA. The ability to easily develop projects that process data between dual FPGA adds an entirely new level of project capabilities.

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>
> – Colonel Bryan Goda, West Point

Power Supply

Because the XUP-UNM board consists of dual Virtex FPGAs, three XC18V04 in-system programmable configuration PROMs, and a wide variety of other parts, we needed a power system that could provide several amperes of filtered power over an extended period of time. The heart of the power system is a Texas Instruments™ TPS54616 buck switching power supply. This supply provides a stable 3.3 volt output to a maximum 6 amp range.

Figure 1 – XUP-UNM prototype platform

Because everything else on the board is driven by this source, 6 amps was a good supply level. Students designed a large portion of the power filtering using Xilinx application note XAPP623.

Both students and professors are currently evaluating prototypes of these platforms at the University of Texas (Austin), University of Texas (El Paso), and West Point. According to Colonel Bryan Goda, an academy instructor at West Point, "This board has great potential within an undergraduate curriculum. We are looking forward to seeing what it can do."

Conclusion

The XUP-UNM prototype platform is a tremendous example of how academia and industry can work together to accomplish a common goal. Experiences learned in these types of endeavors pay great benefits by allowing students to learn from both real world practice and theoretical classroom experiences.

UNM has been a long-time supporter of Xilinx software, hardware, and training, and there are a number of online tutorials developed by the school on many topics. One series includes ISE, VHDL, Floorplanner, System Generator, and XPower (*www.eece.unm.edu/vhdl/*). Another series includes EDK and System Generator (*www.eece.unm.edu/xup/* and *www.eece.unm.edu/signals/*). And yet another indication of the interactive efforts between academia and industry are the annual professors workshops (*www.eece.unm.edu/xup/workshops.htm*).

Dr. Howard Pollard, Dr. Marios Pattichis, Alonzo Vera, and Jorge Parra of UNM were essential to the success of this project. Frank Wirtz and Reno Sanchez of Xilinx Albuquerque, Rick Ballantyne of Xilinx Canada, and Jeff Weintraub of XUP were also a tremendous help. For more information on any of these topics, e-mail Craig Kief at *kiefc@ece.unm.edu* or Alonzo Vera at *alonzo@ece.unm.edu*.