Tutorial IND2A: Embedded Systems Design with Xilinx Virtex-5 Series FPGA

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Abstract:

Embedded systems design is a hot application field which merges logic design and processor-based hardware development in a single or few chips solution. In recent years, embedded applications have emerged at a faster rate and used in every field of one can think of ranging from household products such as microwaves, to automotive products such as air bags sensing and control, to industrial robots which employ distributed processing and coordination. Various technologies have been used in the development of embedded systems; microcontroller, DSP processor, ASIC, and now FPGA.

Embedded systems development involves hardware and software components development as they co-exist in such systems. The software is unique to a system and varies in complexity from system to system and application to application. This peculiar characteristic makes the system development unique and challenging. Typically, such system development involves another system on which design and development takes place.

Field Programmable Gate Arrays (FPGA) from Xilinx, through generations of development, have enlarged applications area envelope. With the introduction of Virtex-II Pro, Xilinx entered embedded processing area. Through the rigorous development of supporting tools and introduction of Virtex-4, Xilinx positioned itself as a major player in the embedded applications area. In order to gain higher performance, Virtex-4 architecture was radically improved and Virtex-5, introduced in mid-April, pushed the envelope further. The trend is to improve silicon efficiency by porting widely used functions in hard core. Xilinx FPGA families carry hard core and soft core processors. The development kits provide hardware/software tools which facilitate implementation of functions, which are not yet realized, by embedding them as soft intellectual property in the FPGA fabric.

In this tutorial, we will show how Xilinx Virtex-5 FPGAs can be used in embedded applications. The strengths of Xilinx FPGAs and the supporting development tools will be described. A demonstration will be provided to show the ease of design and development of a complete system.

Targeted audience:

Engineers who like to know how FPGAs can be used in embedded systems and what Xilinx has to offer in form of FPGA hardware and software tools to design, develop, debug, and successfully develop an embedded system.

Author biographies:

Parimal Patel received a Doctor of Philosophy in Electrical and Computer Engineering in 1986 and a Master of Science in Electrical Engineering from the University of Texas at Austin in 1983, and a Bachelor of Engineering degree in Electrical Engineering from the University of Bombay, India in 1977. Since 1987, Parimal has been in teaching profession, teaching variety of courses including Logic, Design, Digital Systems Design, Microcomputer Systems, Embedded Systems Design, VLSI System Design, and Computer Architecture. Parimal has always enjoyed teaching and developing new courses. He teaches variety of courses for Xilinx in the areas of HDL modeling, PCI, PCI-X, PCI Express, DSP Design Flow and DSP Techniques, and Embedded Systems.