DLK Enables Cost-Effective Design

The new design environment from SENG digitale Systeme GmbH based on FPGAs and standard parts makes it easier to estimate development costs.

by Peter Seng
Managing Director
SENG digitale Systeme GmbH
peter@seng.de

Existing application-specific development and production solutions may be fine for high-volume markets, but for low- and mid-range product volumes, these solutions are most often either too expensive or otherwise not suitable. As a result, these types of products are usually built with off the shelf PC- or microcontroller board- based components. Although standard components are relatively low cost, they are rarely a perfect fit for your design specification and almost always require you to develop and add specialized hardware. Programmable FPGA-based hardware offers an attractive alternative, but so far, entrance barriers have been high, and development time and costs difficult to predict.

SENG digitale Systeme GmbH recently introduced a scalable development environment that makes it easy to prototype and produce programmable FPGA-based hardware using standard parts and at predictable costs. The core of the SENG environment is the Digital Logic Kernel (DLK), which consists of an FPGA + CPU + memory + PC interface. The DLK uses standard Xilinx parts, including FPGA and CPLD source codes, software, and design rules, thus eliminating the need to program equipment or preprogram parts before use. The DLK is, by default, a self-bootable device. To exchange data or for administration purposes, the DLK is accessed via an integrated PC parallel printer port interface. All you need to build, program, and service devices in the field is a PC with a parallel printer port. (Figure 1.)

The DLK Concept

The DLK is well suited for designing, building, and programming products containing any kind of hard or soft CPU with internal and external memory, and programmable logic. The system interconnect concept makes the DLK appropriate for several CPU, FPGA, and (C)PLD device families.
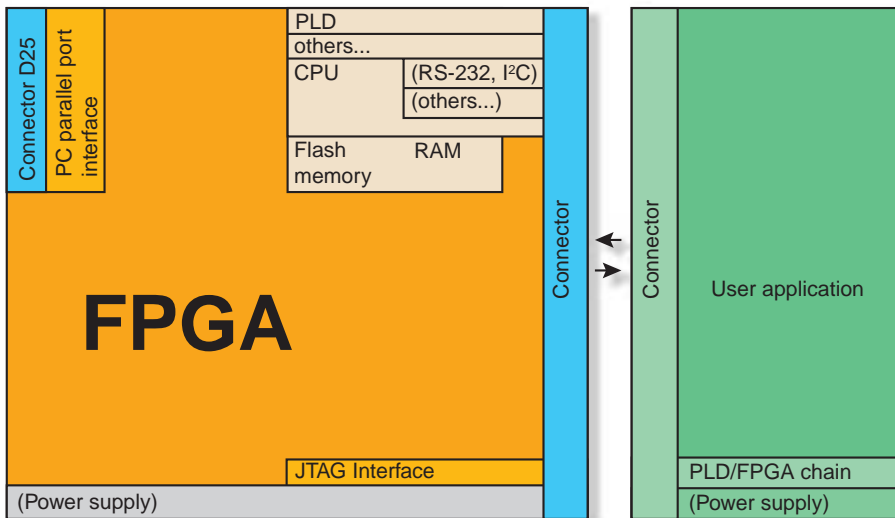
Figure 1 - DLK concept

Components

The DLK development kit consists of software and hardware source code, software, schematics, and a demonstration board. Components include:

- FPGA internal 8-bit bi-directional interface to the PC (Figure 2)

  – parallel I/O bus structure

- Driver and software for several operating systems, including Win 9x- and WinNT 4.0-based OS

- Flash (C)PLD-based state machines and memory

- FPGA internal emulation of JTAG programming interface

- Administration software running on PC for Windows™ OS, including dynamic link library, application program, and source code (Figure 3)

- Demonstration board (Figure 4)

- FPGA source codes (varies with grade of license)

- 8032 C sample source code containing LCD, UART, interrupt ,and i2C routines.

DLK Design Flow

1. Design an application-specific board according to the DLK principles, or use one of the available DLK boards.

2. Rearrange FPGA, (C)PLD, and PC

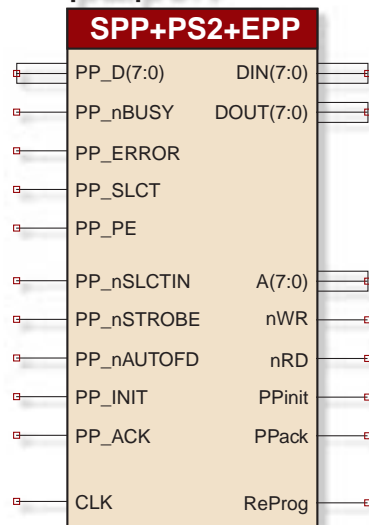*Figure 2 - PC parallel port interface, ISE schematic symbol*

software according to your specific needs; compile.

3. Connect application-specific board to PC parallel port; configure it with JTAG emulation bitstream using DLK software.

4. Use iMPACT software to embed flash memory on board (C)PLD.

5. Develop application-specific logic and CPU programs; compile.

6. Download FPGA bitstream to the board and communicate with it using DLK routines.

7. Debug your application.

8. Store the final FPGA configuration bitstream and CPU program in flash

memory; disconnect from PC. The application is ready.

9. For administration, upgrade, or communication purposes, just reconnect board to PC.

Conclusion

The DLK concept is an open system environment that uses standard tools and readily available elements, enabling development of digital products quickly and cost-effectively. This development system is especially suited for developing prototypes and for low- and mid-range product volumes. The system is compatible with Xilinx ISE design tools and Windows operating systems. The kit includes several real-world examples to minimize training. All source code is available.

The development kit, including demo board, is available now for $298. System and support is available from SENG digitale Systeme GmbH. Write to *info@seng.de* or visit *www.seng.de* for more information. ∑

Figure 3 - DLK running on Windows

Figure 4 - DLK51 board