Configurable System on a Chip (CSoC)

Based on Xilinx EDK & MicroBlaze

Demonstration / Tutorial

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Traditional Embedded System
Reconfigurable System on a Chip (SoC)

How to build such a system?

1. Overview:
   → Xilinx EDK / MicroBlaze Soft CPU core
   → Design- / Tool-Flow

2. Demonstration:
   → Create a simple system
   → Implement the system on a Xilinx Spartan-II FPGA

MicroBlaze: Architecture & Features

Architecture

Features
- RISC
- Thirty-two 32-bit general purpose registers
- 32-bit instruction word with three operands and two addressing modes
- Separate 32-bit instruction and data buses OPB (On-chip Peripheral Bus)
- Separate 32-bit instruction and data buses LMB (Local Memory Bus)
- Hardware multiplier (in Virtex-II and subsequent devices)
MicroBlaze: Bus Configurations

MicroBlaze core

1. LMB: Memory Controller (BRAMs)
2. OPB: Ext. Memory Ctrl., Interrupt Ctrl., UART, Timer, Watchdog, SPI, JTAG-UART, etc.

Bus Configuration 3

1. Instructions and data from internal BRAMs (fast)
2. Data from external memory
Design Flow: HW + SW + Combination

Hardware
- Platform Definition (peripherals, configuration, connectivity, address space)
- Generate Netlist
- Platform Ext. Proj. Nav. / VHDL
- Generate Bitstream

Software
- Gen. Libs
- Compile & Link
- *.h
- *.asm
- *.c
- *.elf

Update Bitstream
- *.bit

EDK: Embedded Development Kit
XPS: Xilinx Platform Studio
ISE: Integrated Software Environment
MHS: Microprocessor Hardware Specification

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Simple System I

- **Function:** LED-Counter
- **MB Bus Configuration 3**
  - Instruction and data: LMB
  - Peripheral component: OPB
  - SW only in BRAMs
  - 1 GP I/O
- **Target:** Xilinx Spartan II-100

Simple System I: Target Technology

**Xilinx Spartan II (XC2S-100)**
- 2700 logic cells (100,000 gates)
- 600 CLBs (20 x 30)
- max. 260 user I/Os
- 40kbit Block RAM
- clock speed: max. 200MHz
Simple System II (Platform: XESS XSA-100)

- Clock (P68)
- Pushbutton (low active, P93)
- Xilinx Spartan2 XC2S-100 TQ144 SC

Demonstrations
For more information...

→ Xilinx®EDK & MicroBlaze: [www.xilinx.com/edk](http://www.xilinx.com/edk)

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